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THE NEW TECHNOLOGIES THAT ARE TAKING ON ILLEGAL DOWNLOADS AND COPIES

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The unauthorised copying of intellectual property is nothing new: people have been able to reproduce the works of others in lots of different ways for centuries. However, with digital piracy, it's never been more easy or of greater quality. That, of course, is a huge problem for creative industries, including those that make and publish videogames. As David Crookes explains, they're fighting back, and it's finally looking like they might actually have the upper hand for once

18 Biggest Fails Of 2015

For every success story in the world of technology, there's an equally astounding tale of utter failure. Sometimes the victims are just unlucky; sometimes they bring it on themselves. Either way, there were plenty of epic fails in the year just gone. Mark Pickavance picks out a few choice examples

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50 Group Test 27" Monitors

Kitting out you PC with a 27" display is no longer a pipe dream for anyone but the extremely wealthy. These days, you can actually pick one up that can be accurately described as 'affordable'. What should you be looking out for, though? To help you decide, we've been checking out six large gaming monitors to see what they have to offer

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If you've ever wished you could run your favourite mobile apps on a desktop computer or laptop, then you're in luck. There are plenty of emulators that will allow you to run Android on your PC, and some of them are free too. Aaron Birch has been scouring the web to find out what's available and what it can do

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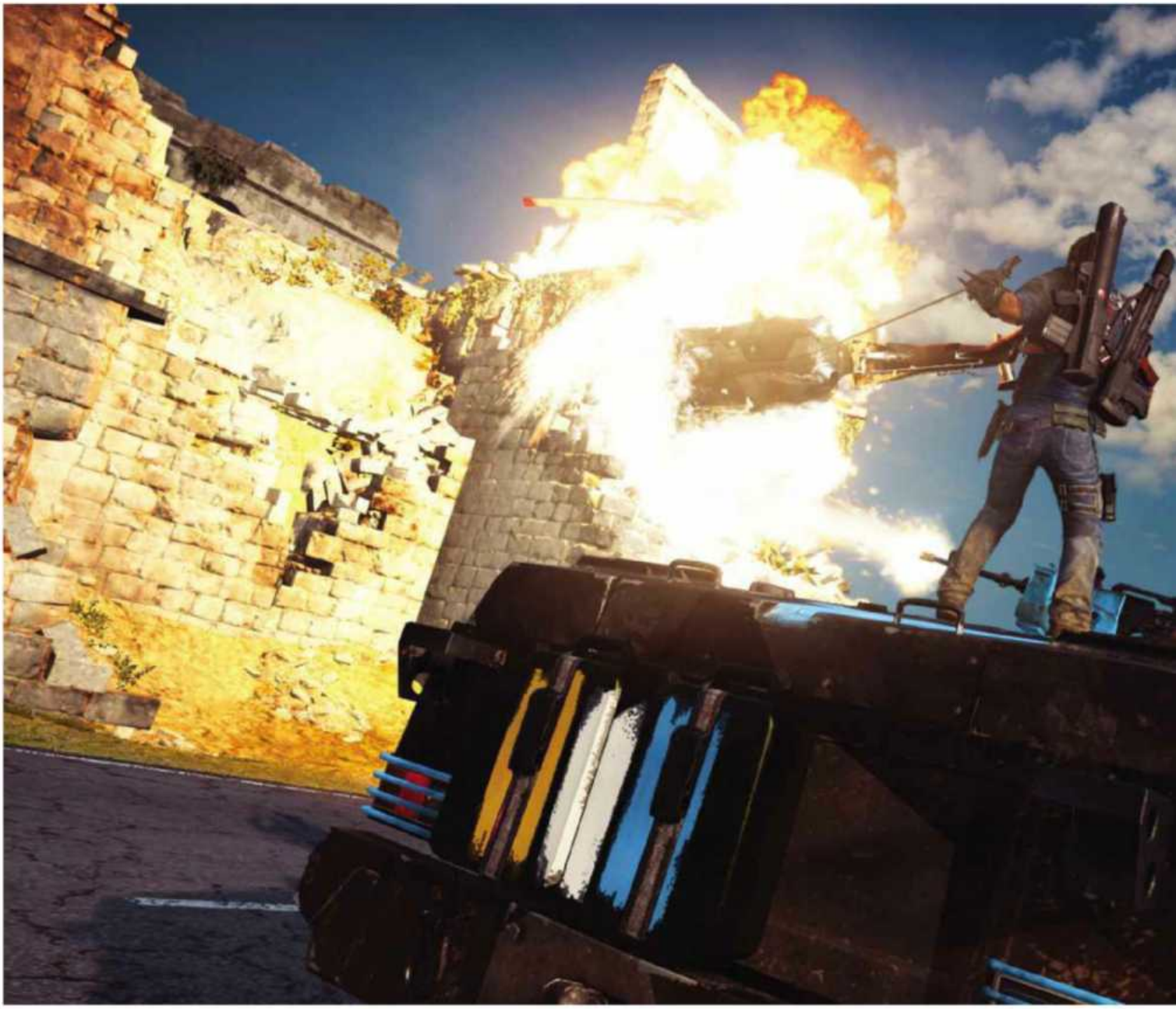

Is Piracy Finally Being Beaten?

A group of crackers reckon the number of pirated games looks set to dry up by 2018, as David Crookes explains

You may well be aware that *Football Manager* is blamed for more divorces than any other game ever made. But did you know that the stat-packed title, which gives fans a chance to take the tiniest of minnows to the glory of the Champions League, is also the most illegally downloaded game of all time?

Football Manager's main producer, Miles Jacobson of UK-based Sports Interactive, told an audience at the London Games Conference in 2013 that the game had been cracked in May that year and had subsequently been illegally downloaded 10.1 million times. It was so widespread that it earned the game the inglorious title of the most pirated videogame ever in the Guinness World Records.

Over the years, piracy has been a pain in the backside for developers of games and other software. And *Football Manager* has proved to be just the tip of the iceberg. In 2008, *Spore* was found to have been downloaded over peer-to-peer networks more than 1.7 million times. In 1987, the creators of

“Over the years, piracy has been a pain in the backside for developers of games and other software”

Leisure Suit Larry said the level of piracy was so high that the company sold more hint books than actual copies of the game.

But there is a game, it would appear, that has the pirates well and truly beat, leading some hackers to throw up their arms in defeat and suggest that piracy may be a thing of the past as soon as 2018. That game is *Just Cause 3,* and while it may well have a story mission called An Act of Piracy, there is little chance of anyone successful breaching the title's incredible defences, much to the annoyance and upset of the hacking community.

News of this great deterrent emerged when 'Bird Sister', the founder of a notorious Chinese cracking forum called 3DM 'warned' that there would be no pirated games to play within two years, such is the difficulty of breaking through current anti-piracy technology.

Not that it's for a want of trying. Hackers have been pushing really hard to breach the Denuvo security that protects the game, but it eventually led to the 3DM founder writing, "Recently, many people have asked about cracks for 'Just Cause 3', so here is a centralised answer to this question.

Why Time Matters

Imagine you're a cracker and you've been working your socks off to crack *FIFA 16*, trying every trick in your repertoire and working out new methods in order to allow the game to be distributed for free. It's a major challenge, and it's taking so long, it's not only zapping your time spent here on earth to the point where you may begin to question just what you're doing, it's also starting to draw frustration from the very people you're seeking to impress and serve.

Come the point where the previews start looking ahead to *FIFA 17,* and the cracking of *FIFA 16* becomes less important in terms of giving people free software and more about the principle of not wanting to be deterred. But it could be seen as a failure. By the time *FIFA 16* is cracked, it could be that gamers are actually enjoying *FIFA 17* and the triumph is buried in a few internet posts that are overlooked and quickly ignored.

This is the demoralising factor, and it's what the anti-cracksters are looking to capitalise on. It's also why the name of the game is to delay, delay, delay. It would, they hope, cause crackers to call it a day, and it has the potential to alter the approach of the entire videogames industry, perhaps leading to a wholesale swing back from free-to-play to 'pay up front', safe in the knowledge that they have the pirates beat.

It's the company the crackers are growing to hate, but Denuvo is putting up the most determined fight against piracy

The last stage is too difficult, and Jun [the person doing the cracking] nearly gave up, but last Wednesday I encouraged him to continue."

She added, "I still believe that this game can be compromised. But according to current trends in the development of encryption technology, in two years time I'm afraid there will be no free games to play in the world."

This, as it happens, is no big surprise. The protection created by Denuvo Software Solutions GmbH has proven very effective in previous versions. *Dragon Age: Inquisition* took a month to crack in 2014 – something that caused a few raised eyebrows in the hacking community – and while 3DM managed to break that seal, Denuvo only came out fighting.

> **"FIFA 16, which has Denuvo protection, remains uncracked five months on"**

FIFA 16, which also had Denuvo protection, remains uncracked five months on, and *Just Cause 3*, which was released in December, may fall into the same bracket. Finally, to the joy of developers and publishers, the industry appears to be winning, and the old adage that any game could be cracked may well have to be revised.

Chinese Crackers

To hear that the Chinese are so adamant about trying to push for a breakthrough with *Just Cause 3* only serves to highlight the world hierarchy when it comes to PC piracy. When *Football Manager* was cracked, a flaw called Home allowed Jacobson to discover the IP addresses of every illegal copy downloaded, and of those who snatched a free copy, 3.2 million were from China.

Enterprising lawbreakers in China have made piracy a huge problem, and there has long been a suspicion that the root cause was the country's ban on videogame consoles in 2000. At the time, the Chinese authorities feared games had a negative impact on the development of children, and the ban meant it was difficult to buy legitimate copies of games. Crackers filled a gap, opening up a vast black market of pirated software. It then became a way of life for many people, so it has continued to be a passion for many even after the restrictions were eased in July last year.

Knowing that the 'something for nothing' culture has been cultivated in China when it comes to software, companies have been doing all they can to rectify the situation and change attitudes. An investigation by Microsoft, for example, discovered that every one of the 169 PCs they had purchased from shops in China had a pirated version of Windows installed on them and, worse, that 91% of them contained malware.

Such concerns prompted Microsoft to allow Chinese people using pirated versions of Microsoft Windows to upgrade to Windows 10 for free. It announced the move last March ahead of the operating system's general release. Terry Myerson, head of Microsoft's operating systems unit, told Reuters there were "hundreds of millions" of people in China it could reach with the initiative. BSA, an industry group that tracks the use of unlicensed software, also found that 74% of commercial software in China was pirated.

Yet the problem is not only confined to China. Jacobson found that 1.05 million of those who obtained a free copy of *Football Manager* were from Turkey and 781,785 from

Pirates Don't Cost The Industry A Fortune – Says Successful Games Designer

"There's an idea that if pirates can copy a game, then our industry loses a bloody fortune," says stalwart games designer Dave Perry. "These people also think if pirates can't copy a game then they will all rush out and purchase it. I just don't buy into that idea."

Perry, the creator of *Earthworm Jim* and ex-owner of Shiny Entertainment, believes that for most pirates the fun is not in playing games but in being able to copy and collect them.

"Some people pirate, just to pirate," he says. "They never have time to play the games they copy anyway.

"My personal opinion is that it doesn't cost the industry anything like the figures thrown around."

Perry puts pirates into three categories: those who copy, those who buy copies and those who sell copies.

And he thinks nothing can be done to stop them. "Pirates will always exist and will break every protection system on offer," he says. "They are smarter as a group than any individual that will be assigned the task to defeat them. The more ridiculous the protection system – challenge, response, DRM, dongles and so on – the more you just punish the people that actually forked out hard cash for the game."

Perry believes copying games can actually increase sales. "It's a bit like when cassette tapes came out for the music business. It was so easy to copy tapes, with zero protection. Yet the business actually grew as people shared music and found new artists they liked.

"So the answer is to move with the times. Understand the motives and work with gamers."

David Perry

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Portugal. A further 547,000 people pirated the game in Italy, and one person did so from within the Vatican. Of course, there is a need to take population sizes into account too, but there is every indication that it's a global issue – one that Jacobson believed equated to 176,000 lost sales, on the basis that 1.74% of illegal downloaders would have bought the game if the crack had not existed.

In hard cash, the loss was some $3.7 million, and Jacobson's despair at this sounded as if his favourite team had lost a football game by a last minute penalty. "Crackers are going to crack and people will download," he told the audience, inevitability in his speech. The latest developments, however, suggest otherwise.

Just Do It

To discover that *Just Cause 3* has been the straw that broke the crackers' back is rather apt, given the comments of Avalanche Studios founder and head Christofer Sunberg five years ago. He said "always-on" DRM was "completely useless", which was good news for those who say it's a malicious feature that impacts on the free market and fails to distinguish between legitimate and illegitimate users.

> **"Crackers are going to crack and people will download"**

"Forcing people to be online all the time and so on doesn't show respect to the people who actually buy games," he said. Sunberg also believed there was a gold mine of talent among hackers: "50% of the people that work for me come from a hacker background." With *Just Cause 3*'s publisher, Square Enix, turning to a different kind of anti-crack protection, though, the company and its publisher have been able to protect their revenue while allowing legitimate users the freedom they expect.

Yet not every game is employing the system. As it stands, just nine blockbuster games including *Metal Gear Solid V: The Phantom Pain* and *Batman: Arkham Knight* use it, but with such a prominent cracking group bringing Denuvo to the world's attention, the number of games and other PC programs that seek to take advantage may well shoot up. Certainly, if a survey by the industry's trade body, TIGA, is anything to go by, taking constructive and innovative approaches to piracy is important for developers and publishers. Everyone has to eat, after all.

TIGA surveyed UK developments and found UK developers and digital publishers overwhelmingly favoured the adoption of new business models to minimise the problem of piracy, with 87% of respondents preferring this approach, compared to only 10% feeling stricter enforcement of intellectual property rights is the way forward.

Piracy is clearly having an effect, with 57% of respondents saying it is a problem for their business. In spite of this, 73% of developers disagreed that people who persist in illegally swapping copyrighted files of films, music and games on the internet should have their internet connections slowed down and ultimately severed, even if they ignore warning letters to stop.

Five Innovative Anti-Piracy Measures

Far Cry 4

When players of *Far Cry 4* began to complain that the game did not offer field-of-view options, they were unwittingly letting the world know that they had a pirated copy of the game in their possession. As it turned out, a day-one patch for legitimate users introduced the very feature being complained about. "PC players!" said the game's director Alex Hutchinson, "If you're online complaining about the lack of FOV control... You pirated the game!"

Mirror's Edge

Mirror's Edge is known for its fast and fluid gameplay, so imagine the frustration of players when they were getting to important jumps only to find that the game was slowing down, hampering their chance of progress. This only happened when players were using a pirated copy, thanks to a special piece of detection code that worked out if the game had been legitimately purchased. It came into effect during the tutorial.

Batman: Arkham Asylum

A gamer wrote on the Eidos forums, "I've got a problem when it's time to use Batman's glide in the game. When I hold ',' like it's said to jump from one platform to another, Batman tries to open his wings again and again instead of gliding". A user reminded him the game wasn't available on the PC at that time and that the problem was included in the copy protection. "It's not a bug in the game's code, it's a bug in your moral code," he added.

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In 2013, when the survey was carried out, 73% of those surveyed said it was staying at a constant level, with 40% of respondents saying they still expected it to be a threat to their business in five years' time. As we've seen, though, the crackers beg to differ, and it points to so much having changed in such a small amount of time.

The emphasis is well and truly on hinderance. *Spyro: Year of the Dragon*, which was released in 2000, was the first game to feature a brand new copy-protection system that booby-trapped it against piracy and ensured it took longer for people to crack the game's code. By delaying the time it takes to crack a game, it opens up a window for legal sales. Those who want the game for free get sucked into a waiting game that, as it currently stands, can last months and may one day stretch to years.

At the same time, software companies have been employing different methods to combat piracy, by taking money out of the equation, initially at least. "TIGA's survey shows that many games businesses continue to find the most effective response

> **"A lot of the older games would have run the risk of being lost forever if they were not cracked and made available to download"**

to the problem of piracy is to adopt new business models, such as subscription-based services and free-to-play games," said TIGA CEO Richard Wilson. With those types of business models combined with technology such as Denuvo, piracy really could be off the agenda in 2018.

To What Effect?

But is this really entirely desirable? There is a school of thought that cracking can actually have a good deal of use. If you're into playing older games on emulators, then you're entering a whole grey area in and of itself. For a start, the emulator is mimicking a copyrighted machine, and it often means getting hold of a ROM that, in itself, can be illegal. Then there's the matter of grabbing games from the internet. A lot of the sites that exist for the downloading of older games contain cracked titles.

Some worry that, in the future, games preservation will suffer. A lot of the older games would have run the risk of being lost forever if they were not cracked and made available to download. And just as tapes and disks can degrade or become discarded, so servers can close and digital files can be deleted. With heavy protection comes the risk that a piece of software will cease to work on a particular system in the future without being cracked. Make it impossible to crack, and the short-term gain leads to long-term pain.

Of course, the flipside to this argument is that a lack of protection would lead to less of an incentive to write software and games in the first place. At the same time, the cracking of older games has led to a market for refreshes of those games today. *Leisure Suit Larry: Reloaded* was released in 2013, giving the original adventure a modern-day makeover.

That said, creator Al Lowe wrote, "I'd like to say to all of those that pirated the [original Larry] games, we're going to

Alan Wake
It would appear that Remedy's head of franchise development Oskari Hakkinen was rather sanguine about the possibility of *Alan Wake* being pirated. "Some people are going to pay for it and some people aren't," he said. "At the end of the day for us, it's about entertaining as many people as possible." However, that didn't stop Remedy from making the lead character wear a pirate-esque eye patch in cracked copies – just to hammer home that it was not legit.

Grand Theft Auto IV
Although it's a game about crime, that doesn't mean it wants rogue players to benefit from the hard work of the developers. When players got through the prologue, the camera would begin to wobble violently, making the game unplayable. Indeed, even if a player decided that they could put up with this, they would soon find trouble when they climbed into a car and realised it would zoom away with them and begin to smoke.

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▲ *The Reddit forums keep an eye on the latest pirated games – but the members have to wait longer and longer for their illegal freebies*

give you a new chance to come clean and own up – man up – and buy a copy come January." It could be argued that the audience for the remake would not have existed without the original crackers, not the availability of the game via emulation. Not everything is black and white, after all.

Being honest, though, future proofing games to allow them to be enjoyed forever more is not the incentive of most crackers. The Reddit forum members who post 'crack statuses' of various games just want to play games for free. There are currently more than 5,500 comments on the matter of *Just Cause 3*, and there is a desperation to see the game fall, with some seeking to defend the suspected immorality of their actions. "3DM cracks games not simply to play them for free but because it's a challenge," writes one.

There are also those who see it as a continuing war. "I think Denuvo wins if they can last longer than the previous version,"

> **"By delaying the time it takes to crack a game, it opens up a window for legal sales"**

another writes. There is even a thread entitled, "Please stop with the Denuvo s***posts please" with the opening post saying anyone writing: "Omgz DENUVO END PIRACY!!1!" will see the offending words removed. But as long as the anti-piracy measures become more and more advanced, the greater the chance that threads such as "Let's pray that *Rise of the Tomb Raider* doesn't take a long time to be cracked" will exist to frustrate gamers who don't want to fork out for their entertainment.

In the current climate, it would appear that, yes, the tide really has turned and that crackers may well start to give up even trying, rather than dedicating months of their lives to the challenge of allowing the masses to play the top titles for nothing. That said, there is still a lot of optimism in the cracking community and among those who benefit from having free games made available. "Do you think in two years AAA piracy is dead/dying?" asked a survey on **strawpoll.me**. There were 406 votes, with 75% indicating "no". But there is every chance it will die, and we can only wait and see. **mm**

History Of Piracy

Piracy has been a problem since the dawn of gaming. Here are three issues the industry has battled with.

Tape And Disk Copying

In the 1980s, a school playground wasn't complete without someone dishing out a stack of tapes or disks with some freshly copied goodies on them. For cassettes, a twin-deck recorder was all that was needed, and for disks, there were always lots of copy programs around. Codes printed within inlays, and technologies such as Lenslok, tried to counter the efforts.

CD Copying

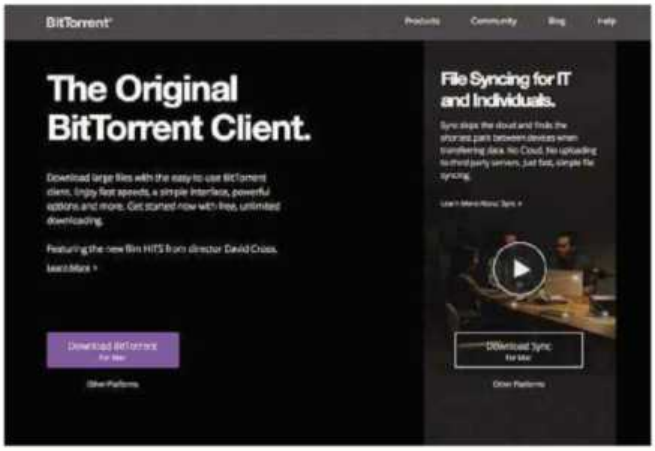
With the advent of CD-Rs and recordable CD drives, piracy continued on a different medium. Although they were cheaper to manufacture than cartridges, console makers didn't initially factor in modchips. By taking a console to a dodgy geezer with the know-how, it opened up a whole world of car-boot shenanigans, bringing mass piracy to consoles.

R4 Cards

Easy to pick up online, the R4 cards caused major headaches for Nintendo, which was annoyed that they allowed people to pirate games on its DS handheld. The devices looked like DS cartridges, but they had a micro-SD slot. By copying games to a micro-SD card and inserting it, it was possible to take advantage of an internet's worth of entertainment.

Torrents

The internet brought its own problem for the PC with file-sharing networks, torrents and downloads allowing the speedy delivery of free commercial games. DRM was the main response to this, but only recently have the steps taken to prevent games from being cracked led to a drying up of major pirated releases emerging online.



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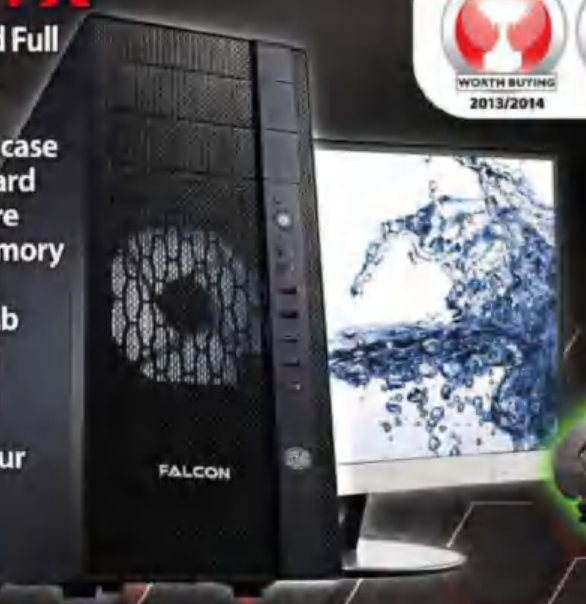

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Spectacular Tech Fails Of 2015

Mark Pickavance covers some of the less than triumphant moments that technology brought us in 2015

For many companies, it seems, failure is always an option. Some of these are failures of management. Others are failure to communicate to the customer, and a few are just the sorts of disasters that modern tech businesses seem to naturally attract.

In many respects, 2015 has been a classic year for technological fails. Here are just a few of the moments that those involved would undoubtedly prefer to forget.

Volkswagen

Let's start with a story of greed that led the world's largest automotive company to do something so stupid and with such massive implications that its reputation will probably never entirely recover.

Across the world, but possibly especially in China, people are very conscious of how cars contribute negatively to air quality, so people are attracted to vehicles that offer less of an impact on their environment. But owing to the price of fuel, they also want economy, and to a degree the two ambitions don't sit well together.

Volkswagen found a way to square that circle using software. When one of its vehicles sensed it was being emissions tested, it went into a special mode where it performed badly but put out limited pollution. And, conversely, on a normal road it would go further on a tank of fuel but put out anything up to 40 times as much emissions.

It got caught because, ironically, an organisation that wanted to promote clean diesel cars got involved with a US university so they could run some tests and then package that information in a white paper. The disparity between what the vehicles did in the lab and on

the road was so great they were forced to inform the standards enforcers, and Volkswagen's house of cards came tumbling down.

Initially it was sold by the company as just a couple of rogue engineers and only Volkswagen diesel cars in the US, and then it spread to Audi and Porsche, and petrol, and in Europe and across the world.

> **Like Ahab and his white whale, Microsoft was prepared to hunt its customer down, whatever the cost**

The idea that this was a handful of rogue engineers now seems completely untenable, and so does the notion that these things weren't sanctioned at a much higher level.

The stock value of the company has crashed, it's sold at least 20% fewer cars this year, and its reputation is sitting bewildered in the gutter.

The calculations for what this will ultimately cost are still growing, but it could be the most expensive intentional software error in the history of computing.

Microsoft Upgrade-gate

Considering this story broke at least four months ago, as I'm writing this, there are still developments continuing, which is rather disturbing.

If you missed the hoo-ha, even before Windows 10 launched, Microsoft managed to annoy plenty of its customers by installing an app onto the taskbar of all Windows 7 and 8.x installations. The purpose of this tool was inform people about the new version, tell them it was free, and even allow them to pre-order their copy.

That last bit seemed odd, because it wasn't like Microsoft would be running out of a digital download, would it?

After Windows 10 went live, it altered to enable users to download the files so they were ready when they chose to make the switch, but not long later, the amount of choice started to be systematically beaten out of this message. For starters, those who didn't select to have the files downloaded found that they downloaded anyway – anything up to 10GB – even if they were on a metered connection with Windows 7.

Like Ahab and his white whale, Microsoft was prepared to hunt its customer down, whatever the cost in either good will or reputation. And since then, this view has been only reinforced by the increasingly aggressive methods Microsoft has employed to strong-arm Windows 10 onto people's computers come what may.

In addition to being harangued every time they log into their systems, Windows 7 and 8 users have recently been presented with a new panel that offers them the choice of upgrading immediately or later that evening. There isn't a choice of not upgrading, and the whole thing seems reminiscent of a joke animation that went around about Florida voting booths where when you tried to vote for a Democrat, the buttons swapped so you always clicked on the Republican choice.

But Microsoft isn't done yet with trying. No, starting on the first day of January 2016, the Windows 10 upgrade will be elevated to 'Recommended' status, meaning that if your system is configured to install those, you'll come back and find it's replaced your existing OS, even if that's not a choice you explicitly made.

This course of action has failure written all over it, because we generally wouldn't accept a local business breaking into our home and refurnishing it, because 'it needed it', would we?

The increasingly desperate nature of these moves perhaps suggests that the dramatic numbers Windows 10 did at launch haven't been sustained and, since Microsoft gave this version away for free, that it's running out of ideas as to how to make it a success.

Some people are also starting to question the legality of altering people's computers without their consent, implied or otherwise.

Apple Watch

Given the profile that Apple has with the Watch, one might be drawn to conclude it has been another huge success. And when you consider that it sold seven million of them between May and November, it sounds very impressive. That's more than all the other competing wrist-worn devices combined, so how can the Apple Watch be considered a failure?

> **"At Apple, it seems failure is not an option – or rather admitting it exists isn't"**

Well, for starters, the sales of wrist devices have generally been very poor, because many people migrated away from wearing a wrist watch about ten years ago.

The Android devices also generally work with all Android phones, and even they don't sell well, whereas Apple's only works with the last two generations of its phone technology.

If proof was needed that not all is well with the Apple Watch, then consider that the company has been very keen to tell everyone how well the new iPhone is selling, yet it won't release any sales figures at all for the Watch.

Market watchers (sorry…) have concluded that most of that seven million, if that's how many it actually sold, shipped in the first couple of months, after which time the sales fell off a cliff entirely.

The Wall Street Journal said that the Watch, "is not selling nearly as well as some analysts expected," in July, when some analysis revealed that the initial flood of 200,000 units a day had already decreased to fewer than 5,000 units.

When asked about the Watch in a stockbrokers call, CEO Tim Cook said that the product had, "exceeded [Apple's] expectations" but without outlining what those expectations were and how it had exceeded them. Apple is expected to revamp the Watch in 2016 and make it less reliant on the iPhone, in an attempt to exceed its already exceeded expectations.

At Apple, it seems failure is not an option – or rather admitting it exists isn't.

The Reverse Selfie

No story about technological failure would be complete without mentioning Evan Griffin's dad. Mr Griffin senior borrowed his son's GoPro for a holiday in Vegas, and walked around with it on the end of a selfie-stick for much of his break, filming all the amazing things in sin city.

However, he didn't film any of the spectacular views in Vegas, because he didn't understand the way round the camera went. As a result, he filmed himself for the entire time, not the locations he was in.

In what was to become a YouTube sensation, Griffin demonstrates what people who have little or no interest in technology can do with it at their leisure.

For those who'd love to see a man narrate pictures of himself looking at a big city, search for 'An Irishman In Vegas' on YouTube.

Google Glass

Google Glass came, saw, and left stage left. After a very high-profile launch, where developer versions of Glass were distributed widely and people managed to annoy others using them for a short while, Google withdrew Glass. It was the sort of retreat that technology companies hate, because despite numerous obvious problems with the technology and the ethics of wearing one in public, it still garnered plenty of interest.

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However, Glass seemed unable to shrug off the general perception of being a gimmick, and it was heavily criticised by many developers for being very limited in both what you could do with it and in respect of battery life.

In January 2015, Google ended the 'Google Glass Explorer' program, as it called it, and you can no longer get the beta hardware it had previously made available.

A month later, a story circulated in the US that an ex-exec and designer of Apple, Tony Fadell, was working on the project and that Glass wouldn't be available again until it was deemed 'prefect'.

Since then, Google hasn't talked about Glass, and many in the industry are considering the project to be effectively dead.

Microsoft Hololens

I can't believe I'm mentioning Microsoft again, but it's effectively double dated with failure this entire year, it seems.

When the Hololens was first revealed, lots of people got very excited, because it was something new. Excited American journalists shown the prototype systems tweeted that this product was revolutionary and 'a game changer'. Microsoft promised that Hololens would be made available after Windows 10 launched, and that people would be amazed at what it could do.

Having buffed the Hololens brand to a mirror-like finish, everything that's happened since has succeeded in taking the shine entirely off it.

About two months after the initial demonstrations, journalists in the US were shown the pre-release version of the hardware and were shocked as to how it wasn't remotely like the prototype in respect of field of view. Where the prototype was immersive, the supposedly near-finished product had a very small viewport that made it appear like a VR world through a letterbox simulator.

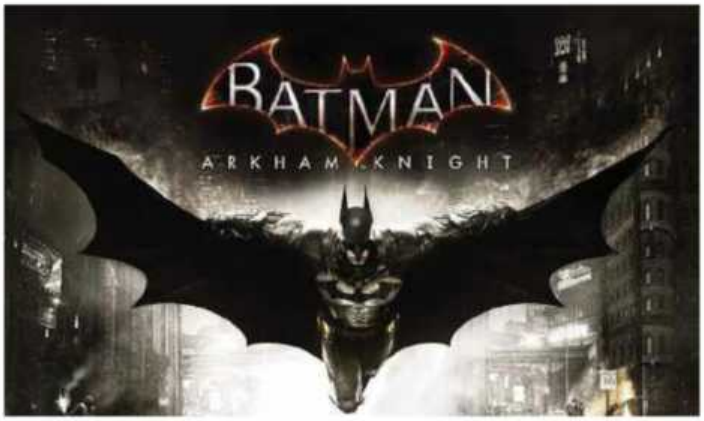
A few who'd experienced the earlier demo asked Microsoft people if the hardware was broken, only to be told that this is what Hololens would be like.

What really annoyed people what that at least three times since then, Microsoft has given stage demonstrations that don't show the clipped view and has had numerous journalists call it out for misrepresenting the product.

This it's entirely ignored, and it's also moved from a situation where Hololens would be coming soon, to a much longer timescale, with CEO Satya Nadella now saying "This is going to be a five-year journey."

The development kit is due to ship early in 2016 to those Americans who can stump up $3,000 to peer through a digital letterbox.

That sound you can hear, Mr Nadella, is the audible deflation of the tech community that for a brief moment in 2015 you'd



managed to enthuse before you brought it down to earth with a mighty bump.

The inability of this company to communicate effectively is entirely encapsulated by the Hololens project, because not only could it not do what it had promised technologically, it couldn't even tell people about it in an honest and proper fashion.

Batman: Arkham Knight

Anyone who saw the pre-release trailer for this game and was remotely a Batman fan couldn't help but be excited by this title, given that it was the latest in the excellent *Arkham* game series.

Or rather they would have been on the Xbox One or Playstation 4, because the game's developer, Rocksteady, outsourced the PC version to another team, Iron Galaxy Studios.

> **"Setting up a website specifically to have extramarital affairs was always going to be controversial"**

Almost immediately after release, it became apparent that this had been a huge mistake, and on many computers the title was virtually unplayable. Many reviewers who covered the title tore it to pieces, some even suggesting that it had been launched without any optimisation or polish whatsoever. The problems were so serious that Warner eventually suspended sales of the game on the PC, while it awaited a critical software patch.

It's since had a series of patches, but problems still exist in regard to the fluidity of play even on high-end systems.

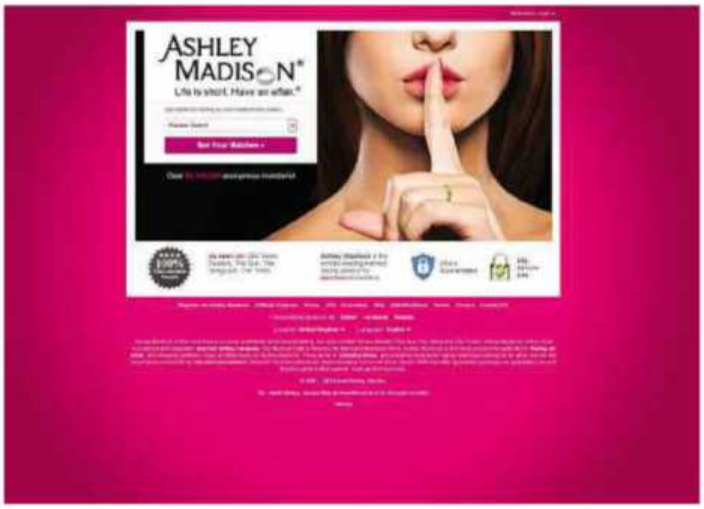
In October, it went back on sale, but the number of reported problems eventually caused Warner to offer a full refund to anyone who wasn't fully satisfied. Rocksteady and Warner Bros have promised that further patching will continue until the title is of the standard that it should have been, although how long this is likely to take is unknown.

Apple Music

When you consider that iTunes was the first big digital distribution service, you'd think that Apple might understand what those who buy music want. But when it launched Apple Music, its all-you-can-eat streaming service, many people wondered if it was the same company, or one just pretending to be it.

Actually, technically it was a relaunch, because Apple previously offered the same service called 'Beats Music', which it acquired from Beats Electronics in 2014.

The unique angle that Apple took was to provide much less than the entry-level Spotify, but at the cost of that company's Premium service, through a remarkably clunky interface, with no free access whatsoever.



It also managed to mess around with the way that music locally synced with iPhones and iPads in a way that really mucked up lots of its users.

As if to add insult to injury, it also welded this service into the appalling iTunes PC application – a tool that is now so poor and disjointed that many people refuse to install it on their computers.

Apple spent lots promoting the service, but even it couldn't suppress the abuse the service was given by the music listening fraternity. The Apple Music service has just a fraction of the subscribers Spotify can claim, and it has yet to provide any compelling reasons for even the most ardent Apple fans to use it.

Despite being available in more than 100 countries worldwide, Apple Music has fewer than seven million subscribers and no appreciable growth on the horizon.

Ashley Madison

Setting up a website specifically to have extramarital affairs was always going to be controversial, but Ashley Madison gained even greater notoriety in 2015 for entirely different reasons.

A group identifying itself as 'The Impact Team' hacked the company's servers in August, taking 25GB of company data that included personal information of its customers and internal email correspondence. They subsequently published much of this data online, to the general embarrassment of all those involved.

However, the public naming of people using Ashley Madison was only the start of this operation's troubles, because the data also revealed many fascinating facts about Ashely Madison that have called into question the authenticity of the business model those behind the website had built.

It's been determined that of the 5.5 million female user accounts, only 12,000 were actually used, and therefore the chance of any man getting a reply from a women he contacted was incredibly small. Ashely Madison charged for direct communication, so it was taking payment for men to mostly send messages to accounts that had either never been used or, in many cases, were entirely fake.

It has also been reported that many women found their identity registered on Ashley Madison despite having never had any association with it. This led to the conclusion that in an attempt to rebalance the massive excess of male customers, the company had generated large numbers of accounts automatically based on personal data it had bought.

At this time, a $576 million class-action lawsuit has been filed against the company. And while the website still exists, amazingly, the long-term viability of the business is now severely in question.

Lenovo Superfish

For a long time, system reviewers have complained about the amount of junk that some brands put on their computers. There's so much of this junk that users need to go through a de-gunking exercise after buying a new PC.

Lenovo is a big embracer of crapware, but even by its own standards, the Superfish debacle took it into uncharted territory for customer abuse.

For those who missed this particular train wreck, it started with a company called 'Superfish', which developed ad-supporting software based on a visual search engine. This was something that Lenovo decided it would subject its customers to, and it pre-installed it on a number of its branded PCs. But Superfish had a dirty secret: it used a universal self-signed certificate authority. This could be used to fashion a man-in-the-middle attack that could insert malware into any web page, even those encrypted using a valid certificate.

What made this much worse was how the company reacted when news broke that it made all its customers vulnerable to attack. First, there was the denial, then the mitigating it-isn't-so-bad phase, before CTO Peter Hortensius finally accepted that, "We messed up".

From what I've seen of Lenovo installations since, it's still messing up, just not with Superfish at the moment.

BBC Atos Fiasco

In 2004, the BBC signed a huge contract with Siemens to provide it with IT that was worth £2bn. This deal was called Atos, and it was supposedly intended to bring the broadcaster into the 21st century.

Yet despite that unprecedented investment of public money, the past 11 years have seen a succession of expensive IT failures at the BBC. Some of these have been Siemen's fault, others

the BBC, but the vast majority involved both parties and were characterised by lack of cost control, vague objectives and failure to deliver within pre-agreed timescales.

Of these, the worst example by far was the Digital Media Initiative, a grandiose project that intended to replace existing tape archives with a completely digital system, enabling rapid searches and retrievals.

On paper, this sounded a laudable exercise, given the stupidity of the corporation in managing its existing archive, where many valuable and unique early recordings were erased in the 70s in a misplaced drive to reuse video tapes.

When the development of the Digital Media Initiative was finally halted, some £100m had been spent, with not one single operational component or service to show for it.

In 2015, having had the big stick of cost control waved at it by the treasury, the BBC finally ended the Atos contract, and it intends to outsource many of the IT infrastructure as part of a new project called Aurora.

These will be smaller and shorter deals than Atos, and the first of these was due to be awarded in the coming year. However, Aurora is already delayed, so Atos has now been extended until March 2017, at an additional cost of £285m. This seems a large sum of money for a service that on one occasion left the news room so poorly networked that a newsreader live on air was forced to read the headlines from her iPhone off the BBC website.

Other Notable Tech Fails

Apple certificate lapse: Apple let a digital certificate it had issued lapse, stopping many Mac users from running software they'd purchased through the Mac App Store. Users were forced to delete and reinstall many apps to fix this problem.

Sony Hack: Poor internal security allowed hackers to get into Sony Entertainment's internal computer systems, and steal movies and corporate emails. This was a huge embarrassment for Sony's executives, partners and the company as a whole.

Blackberry Priv: Blackberry went Android, and the smartphone world shrugged in unison.

Amazon Fire Phone: This poorly received phone failed to ignite any customer interest and was extinguished.

Microsoft Windows Phone: Two new flagship phones, but a smaller market than it had when Nokia was a separate company.

Microsoft Surface 4 Pro and Surface Book: Just months after a razzmatazz launch, Microsoft was forced to make a public apology to those who bought its latest expensive technology. It admitted that there are faults with these devices that it's struggling to remedy.

Hoverboards: They don't hover, but they do barbecue a treat

Apple TV: No actual TV, again, but the streaming box was revamped once more and still managed to disappoint. The most entertainment it delivered was Tim Cook's demonstration at the launch, when he tried to operate it using the Apple Watch and it didn't work.

RBS: It's not enough that this bank messed up so badly it's now publicly owned; 2015 proved to be a very poor year for the IT side of this business. In June, it suffered a fund transfer glitch that disappeared 600,000 payments, many to those living off tax credits or disability benefits. This came just months after it was fined £56 million for a previous IT disaster in 2012, when 6.5 million customers were locked out of their accounts for days. **mm**

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Microsoft Surface Family Comparison

David Briddock evaluates the products that make up Microsoft's Surface family tree

MICROSOFT SURFACE FAMILY COMPARISON

Surface Pens

Do you fancy buying one of those 2-in-1 devices that have both tablet and laptop configurations? Then the Microsoft Surface family warrants careful consideration.

The 2-in-1 Challenge

At the beginning of this decade, Microsoft encouraged manufacturers to build 2-in-1 devices, a drive designed to coincide with its upcoming Windows 8 operating system launch. Yet Microsoft became increasingly irritated by the lack of quality and innovation – so irritated, in fact, that it decided to take on the 2-in-1 challenge itself.

The result is the Microsoft Surface family. First launched in 2012, the fresh, bold design did have a few teething problems, but despite an unsteady start, Microsoft maintained its innovation investment, launching an improved model each year.

There's no doubt it was an inspired decision. Today, the Microsoft Surface family is a huge success story. New and updated Surface models receive glowing media reviews and impressive customer satisfaction feedback. Unsurprisingly, sales figures have also soared.

Today, Microsoft's product design and innovation is directly compared with Apple. That's a remarkable achievement after just a few short years, and the momentum shows no sign of slowing down.

Family Portrait

The original Surface had an ARM chip inside and consequently ran a variant operating system known as Windows RT. A year later, the much improved Surface 2 appeared. This was joined by a more expensive model called the Surface Pro 2, which could run the full Windows 8 operating system, thanks to its Intel chip.

But it was the release of the Surface Pro 3 in 2014 that really made everyone sit up and take notice. Its larger screen, slimmer format, more powerful processor and new smart pen projected it far above the 2-in-1 competition. In fact, post-launch stocks levels were unable to satisfy customer demand.

For a while, there was no sign of a successor to the entry-level Surface 2, but in early 2015, the Intel-based Surface 3 appeared. Geared from the start to run Windows 8 (and ready for Windows 10), it marked the death of the Windows RT operating system.

In autumn 2015, the Surface 3 and Surface Pro 3 were joined by the latest Surface Pro 4 models and the brand new Surface Book, Microsoft's first ever laptop. Surface Pro 4 stock quickly appeared on shelves around the world, but UK-based Surface Book buyers sadly have to wait until 2016 for shipments.

This large product family offers plenty of choice. Yet that does make a purchasing decision more difficult, so this week we'll compare the features and capabilities of the various models, assessing them in relation to real world usage scenarios.

Design Overview

Portability is a key design criteria for the entry-level Surface 3. At just 622 grams, it's slim and light enough to become your take-anywhere tablet. However, smaller dimensions do necessitate a slightly cramped keyboard layout, and the kickstand offers only three positions, as opposed to the infinitely adjustable one on the Pro 3 and Pro 4.

The Pro 4 is an evolution of the highly successful Pro 3. Changes include a slightly larger screen plus higher processing and graphics performance. The new Type Pad has an improved keyboard and touchpad. And the redesigned smart pen is compatible with all Surface models.

The Surface Book is a little different. Think of the Book as a fully functional, high-quality laptop, which also has tablet-like features. In other words, use it as a laptop and you'll be happy. However, as a tablet, or in the so called 'clipboard' mode, some flaws are evident.

One problem is the weight. The larger screen means it's significantly heavier than the Pro 4. And tablet-mode battery life is slashed, because most of the battery cells are in the keyboard part. Early reports also highlight screen docking/undocking protocol problems via the highly original articulated hinge.

Of course, this is the first incarnation of the Surface Book. The next generation is certain to incorporate quite a few design changes that'll improve its 2-in-1 credentials.

Surface Book hinge

Display

The first thing any laptop or tablet buyer notices is the display. Consequently, premium-level device screens must deliver speed, clarity and sharpness, along with deep, rich, vibrant colours.

The Surface 3 has the smallest display, yet at 10.8 inches, it's still much larger than an iPad. And with a 3:2 format, 1920 x 1280 pixels and 10-point multi-touch input, it's superior to quite a few similarly priced laptops.

The 12" display on the Pro 3 has a pixel resolution of 2160 x 1440, which is comparable to high-end ultra-portable laptops. The new Pro 4 is better still. It has an ultra-thin PixelSense 12.3" 2736 x 1824 display.

The Surface Book has the sort of gorgeous screen you'd expect from a premium laptop. Measuring 13.5 inches, it ups the resolution still further to 3000 x 2000.

All of these displays work fine with Windows 10, in both desktop and tablet mode. Graphic designer types might prefer the higher pixel densities found in the Pro 4 or Book, but for most of us it really comes down to how much you want to spend.

Weight And Battery Life

Weight and battery life are critical factors when it comes to portability. In general, more weight also means longer battery life, but excessive weight is problematic for any 2-in-1 device when used as a tablet.

The physical dimensions of a Surface device are dictated by its screen size, processor cooling requirements and interface ports. For instance, a full-sized USB 3.0 port is relatively large.

At 622g, the Surface 3 is noticeably lighter than the 786g Pro 4, which is itself just over half the weight of a 1.5kg Surface Book, but remember you'll need to add the 310g Type Cover weight to all non-Book family devices.

When it comes to battery life, the quad-core Intel Atom in the Surface 3 ensures it offers the same claimed nine hours of video playback as its Pro 3 and Pro 4 big brothers. Large, high-pixel-density displays are power hungry, but the official Pro 4 figures say it runs for longer on a single charge than the Pro 3.

Yet – and not for the first time – Microsoft's official battery life claims seem dubious when compared to real-world tests performed by journalists and early adopters. These suggest 'up to nine hours video playback' is more like seven. And if you're web surfing over wi-fi with a fully charged Pro 4, you'll need to find a power socket around six hours later.

Surface Pro 4 Type Cover

The Surface Book is the star player here, with more than 12 hours wi-fi web browsing in laptop mode, but detach the keyboard and you'll also remove a sizeable proportion of the battery. In this configuration, there are under two hours wi-fi web browsing life.

In practice, six to seven hours' battery life is enough for most people. Journalists and anyone else who spends long proportions of their day away from power sockets should probably consider the Surface Book, if funds allow.

Performance

Microsoft offers many different configurations, especially in the Pro 3, Pro 4 and Book product lines, so it's all too easy to get bogged down in the details or thoroughly confused.

First you'll need to have in mind the sort of apps and entertainment software you'll be using. Then carefully assess the suitability of the base-level models against this list. Trying running them on a store demo model, if possible.

Inside the Surface 3 is a quad-core Intel Atom processor. While not an Intel Core chip, it has enough power to happily run the sort of web, media and office apps most of us turn to everyday.

The new baseline Pro 4 model has a Core M3 chip. It was chosen for its cool-running and battery-friendly characteristics. Yet, disappointedly, in tests, this processor is outperformed by the Core i3 chip in the base-level Pro 3.

Just like the Pro 3, the more expensive Pro 4 and Surface Book models have Intel's powerful Core i5 and i7 processors inside, but the Pro 4 and Book use sixth-generation Intel Core chips. Glance at the raw performance statistics and the difference between the fifth- and sixth-generation Core chips seems relatively small, but unwelcome Pro 3 issues like performance drop-off due to heat build-up and excessive cooling fan noise are fixed on the Pro 4.

Graphical processing (GPU) is integrated into the main chipset for all models, with the exception of the Surface Book, so if graphical performance is of critical importance, consider a Book. It still won't offer the same kind of grunt as, say, a dedicated gaming notebook, but it soundly trounces the 2-in-1 format competition.

In truth, all Surface models have high-quality Intel chipsets, unlike many 2-in-1 competitors. Therefore, the typical 2-in-1 buyer is unlikely to feel disappointed. And if your work involves high-demand 3D modelling apps or professional video-editing suites, or you're a hardcore gamer, then a 2-in-1 device isn't the best choice.

Memory And Storage

Moving on to memory, the Pro 3 and Pro 4 models start with 4GB of RAM, while the Surface Book begins at 8GB. In practice, 4GB is sufficient to cope with the demands of a typical 2-in-1 device owner. In contrast, the Surface 3 base model has only 2GB, so it tends to struggle as the number of open browser tabs and simultaneously running apps rises.

The Surface 3 has 64GB or 128GB solid-state disk (SSD) storage. The other family members start at 128GB and, in the case of the Surface Book, go all the way up to 1TB. As you'd expect, buy a higher-performance model, and you'll also receive a larger SSD.

But if all you need is more storage, rather than more power, think carefully as the cost rises sharply. After all, with today's high-capacity memory sticks and a plentiful supply of low-cost cloud-based storage, acquiring copious amounts of local disk capacity isn't as important as it used to be.

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▲ *Surface Pro 4*

Connectivity And Cameras

All Surface models support 802.11ac wi-fi and Bluetooth 4.0 Low Energy. They also have full-size USB 3.0, a mini-DisplayPort, SD card reader and micro-USB charging socket. Incidentally, if you're after 4G LTE mobile broadband capability, you're currently limited to the Surface 3 models.

The big disappointment here is the lack of a USB-C port. With its raw speed and multi-mode flexibility, it's a bit of a mystery why Microsoft didn't include one. And it's a long time to wait for the Surface Pro 5 or Surface Book 2.

The Surface Pro 4 and Surface Book all have a rear-facing 8MP camera and a 5MP front-facing one. The Surface 3 also has a rear-facing 8MP camera, but a 3.5MP one on the front. As for the Pro 3, it has a dual 5MP camera setup.

Any of these combinations can easily capture whiteboard contents, take website images, snap ad hoc photos and handle face-to-face video conferences at home, in cafes and hotel rooms.

Value For Money

For students on a budget, or those after a flexible 2-in-1 solution for browsing, entertainment and home-office tasks, the Surface 3 is a good choice. The storage capacity options are small, but Microsoft doesn't pre-load it with the sort of bloatware apps included by other manufacturers.

Preinstalled with Windows 10, it's a far more capable device than an Apple iPad – or many low-end laptops, for that matter. Another attraction is the free 12-month Office 365 subscription and 1TB of OneDrive cloud storage. In contrast, the other family members only offer Office trials.

The base level Surface 3 costs £419, but the Type Cover and pen are £110 and £50 optional extras, respectively. Add these two, and the total cost rises to a less appealing £579. Interestingly, Microsoft and others have discounted base-level Surface Pro 3 models, with pen, for less than this, although the Type Cover is extra.

Of course, by 2016 we might see the Surface 4, but we shouldn't expect too much in the way of technology innovation, although a sub-£500 entry-level bundle with Type Pad and pen would be welcome.

Surface Pro 4 easily fulfils the daily laptop and tablet computing tasks for eight out of ten people. Yet the under-powered £749 base-level option isn't such good value. In fact, locate a discounted base-level Pro 3 and you could save £200 or more. And the Pro 3 is compatible with the latest multi-coloured Pro 4 Type Pad.

If funds allow, the Pro 4 (or Pro 3) Core M5 processor model is a better choice. This does pretty much everything a desk-based system can do. It delivers peace of mind for those who need a device that copes with anything a working day might throw at them, and it's a highly capable downtime entertainment platform.

The Surface Book has premium features, albeit at a premium price. The base model is $1,500, or well over £1,000 when it arrives in the UK, while at more than $3,000, the top-of-the-range model is a serious investment.

Nevertheless, the Book has no real competition in the 13" Ultrabook category for performance and multi-mode flexibility, which means software developers, graphic designers and other power-users are unlikely to find a better 2-in-1 solution.

Expanding The Family

And what about new additions to the Surface family? Well, in 2015, the Surface Hub appeared. This large wall- or stand-mounted smart-whiteboard display is obviously not a 2-in-1 device, though it has a very similar multi-touch and pen interface. Costing $6,999 for the 55" model or $19,999 for an 84" version, it's aimed at the business marketplace

Another possibility is a Surface smartphone. Currently, the latest Microsoft phones carry the Nokia Lumia brand, but a premium Surface handset with Windows 10, high-resolution display, powerful processor and large memory would complement the new display dock and the clever Continuum app.

Whatever the future, Microsoft's Surface family is here to stay. **mm**

Your Letters

Free Windows 10... NOT!

It all started when my faithful old Desktop PC decided it was time to shut down forever. Yes, I could have repaired it by sourcing old hardware but after 10 years of faithful service I decided it was time to build a new one, after all Pentium 4 processors are quite slow now are they not, and I have seen the future.

My old machine had gone from Windows 98 to XP then XP-SP2 and then to Windows 7. Microsoft has made money from my loyalty, so the plan was to build a new one using my previous Microsoft OS purchases. So I sourced all the parts – excepting the operating system, as Windows 10 is free to loyal customers is it not….Well no actually, it's not.

After a visit to the tip where my old faithful now totally dismantled awaits some form of recycling I returned to build my new shiny PC and install WIN10 a copy of which I had downloaded from MS website and burnt to a DVD on my wife's laptop.

The install on the new Desktop PC went smoothly, and when requested I used the KEY from my Windows 7 Home Premium upgrade DVD believing that as it clearly states on the packaging "for use on one computer or device", there would be no problem as the previous PC was no more, it was a past PC, it had ceased to be, had expired and gone to meet it's maker at the tip.

Well I was wrong! In the eyes of Microsoft, my copy of Windows still exists on a dead computer by some miracle and is not transferable to another. So I was pleased my old PC had not expired the day after I had upgraded it to Windows 7 as I presume would have lost the £80 I had paid for it at that time.

So here is the problem: I now have a copy of Windows10 that keeps asking me to 'Activate Windows' and so, I guess, I will not get upgrades unless I pay for a new licence.

I contacted Microsoft with my problem and, after letting them have remote control of my desktop online and discussing my honest problem they concluded I should spend more money with them and buy a Windows 10 key.

I, on the other hand, suggested I could perhaps start again and use the equity in previous purchases and install XP, XP-SP2,WIN7 and then apply for the upgrade, but they said that would not work either.

Guess what? I will not be buying a Microsoft phone anytime soon and my loyalty to Microsoft, like the old PC, has ceased to be and is no more.

Alan Pedder

IT Equipment

Can I say how much I enjoyed Mark Pickavance's article on essential equipment for IT Profesionals – come to think of it I like all his stuff, and *Micro Mart* is a great Mag all round.

No doubt you will get lots of similar letters to this pointing out some bit of tech he missed out, but my contribution is a PSU tester. I've found this invaluable. When a PC won't boot or sticks half way, is it the motherboard, the disk or the power supply? Just uncouple to 24-pin plug and stick it in here, press the button and hope. The number of PSUs I've found with the -5v light off is amazing and confirms the fix - bung in a new PSU – simple

Keep up the good work.

Mike Summers

Smart watch

It is a funny old world. I need a new watch. The elderly digital watch that I currently wear offers two times zones (that I use), a calculator and stopwatch that I don't, but is ugly and suffers from wear and tear.

I remember buying it on-line about 15 years ago for around £25. It came from New York within three days.

What I want is a watch that gives me day, date and time and can flip between two or more time zones at one or two simple key strokes.

Despite the plethora of gimmicks currently on offer I cannot find one. What does *Micro Mart* think?

Alan Secker

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Remembering...
Star Wars Wireframe Arcade Game

It's Hayward you seek, strong with The Force is he

Since the whole world is still a little *Star Wars* crazy, I thought it would be appropriate to include one of my fondest memories of the vast space opera: the 1983 vector wireframe graphics arcade game.

The arcade where I grew up was surprisingly well stocked for a bleak, northern industrial town. As such, there were moments of intense gaming thereabouts, with umpteen personal contests playing *1943*, *Rygar*, *Gauntlet* and so on. However, when the upright *Star Wars* cabinet arrived, most of the other games grew a layer of dust over their digital screens.

The queue for the *Star Wars* cabinet wound its way around the old arcade, with legions of gamers stacking ten pence pieces on the top of the cabinet, while asking the next person in the queue to hold on to their pint glass. It was quite amazing.

The first wave where you engaged in ship-to-ship combat with Darth Vader and other TIE Fighters, then it was an acceleration to the surface of the Death Star to take out as many laser turrets and towers as possible in the limited time available. Finally, of course, it was into the Death Star Trench for that famous cinematic and cramped chase through the narrow confines, leading to the battle station's only weakness – the exhaust port.

Once you blew the Death Star up, you got a digitised Han Solo commenting on your one-in-a-million shot and Obi Wan telling you that the Force will be with you, always. It was a great finishing move on the part of the developers and one that remains firmly in the nostalgic portion of our memories.

Its History

The Atari-manufactured cabinet came as either an upright style, which was the more popular, or as an environmental cockpit affair where you sat in a faux-leather chair complete with straps to help with that authentic X-Wing Fighter feel.

The project was led by Atari veteran Mike Hally, with designer Rich Adam. Both had a history of creating and designing pinball machines, as well as *Gravitar*. The team used the spare parts of a *Battlezone* cabinet, most notably the controller, as well as a few upright cabinet extras, with the cabinet itself being laden in graphics and featuring a few extra moulded sections to help create an X-Wing cockpit effect.

The game was ahead of its time, and it required some secondary processors to help achieve the fast wireframe graphics and higher frame-rates. Furthermore, the Wells-Garner colour XY monitor required a separate fan to help prevent screen burn-in, and another fan was required to help cool the voltage section on the monitor to extend its lifespan.

In addition to the great graphics, the familiar *Star Wars* soundtrack was littered with digitised speech from the film itself. Through playing it, you'll hear such sound bites as "I can't shake him", "this is Red Five, I'm going in", "The Force is strong with this one" and various beeps from R2D2.

The Good

Incredible gameplay, that was simple but effective. Fast moving graphics and a solid and well-designed cabinet.

Did You Know?

- After fighting the TIEs in the first wave, as you approach the Death Star, the yellow lines on the battle station spell out 'May the Force be with you' or some of project team's names.
- The next game was actually *Return of the Jedi*, with *Empire Strikes Back* following. But you could upgrade the original Star War cabinet to the Empire version with a handy conversion board.
- If you don't shoot anything while in the Trench until you reach the exhaust port, you can get a 100,000 point bonus for using The Force.
- Rumour has it that if you shoot Darth Vader's ship over 30 times, you'll get 27 shields. And if you do this twice in the same game, you can get 255 shields.

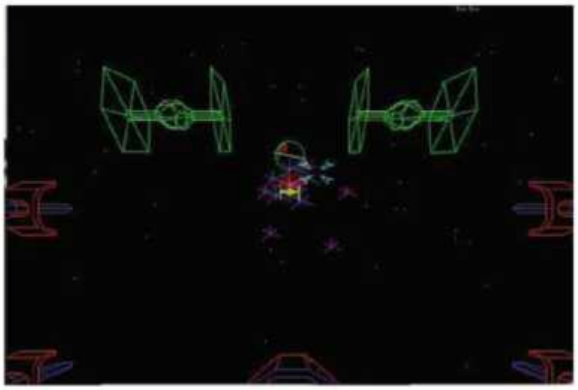
The Bad

Having to wait in line for your few minutes at the machine at lunch time. Having to wait behind the local who's absolutely brilliant at it and spends all day on it.

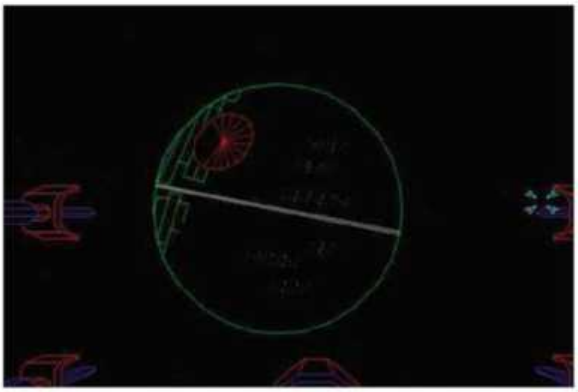
Conclusion

The arcade version was the first memory of the game for us, but it soon appeared on various 8-bit computers – *3D Starstrike* on the Speccy – as well as the Atari ST and even DOS. However, the arcade retains the feel of the game and the era in which it was played.

The original upright cabinet, the one most of us will recall



It may look basic by today's standards, but this was and still is an ace arcade game



Flying into the Death Star after the first wave of TIE's and 'May The Force Be With You' is spelt out on the surface

Component Watch

Feeling a bit dumb? Need a watch? You'll be wanting a Smartwatch, then!

Last week we looked at fitness bands and related wearables – so this week, we're going after the king of wearables: the smartwatch. There are more companies making these devices than Apple and Pebble, but what's so good about the alternatives – and more importantly, what's the best price you can find for them?

Deal 1: HANNspree Prime SmartWatch
RRP: £60 / Deal Price: £55

Arguably the cheapest smartwatch around – unless you've found some obscure brand or stellar deal that we're not aware of – the HANNspree Prime has a 1.54" OGS touch display with micro SIM support and TF storage up to 32GB. Although it can pair with, and remotely control, a phone its SIM support means it can also function as a stand-alone device with much of the functionality that a smartphone provides. The built-in 0.3 MP camera can be used for video calling, and you get a vibration function, music player and sound recorder built in as well. Great for budget buyers as a reasonably priced introduction to the future of tech, if the tech companies have their way, anyway.
Where to get it: Ebuyer (**bit.ly/1KdZ6VF**)

Deal 2: Martian Notifier Smartwatch
RRP: £80 / Deal Price: £70

The Martian Notifier is a combination analogue/digital smartwatch. As such, it has a classic analogue face, but also contains a small LCD screen for text alerts and other notifications. Once you have paired it with your smartphone it can receive call ID notifications, preview text message and other push notifications, and even issue voice commands to your phone. There's no touchscreen, but tapping the glass will dismiss notifications. It's also designed for fashion with multi-coloured, easily changeable bands. Ideal for those who want their watch to look good – and, er... like a watch – while also offering some of the digital features of the new breed.
Where to get it: Dabs (**bit.ly/1Q6qvip**)

Deal 3: Asus Zen Watch
RRP: £100 / Deal Price: £90

The Asus Zen Watch is an Android Wear watch with 4GB of storage with a leather band and over 100 customisable LCD watch faces for the 1.63" screen. There's voice, touch and gesture input as well as a microphone and NFC communication capabilities. Optimised for Android 4.3 and later, it's also compatible with the iPhone and has built-in GPS with scratch-resistant gorilla glass. A comfortably mid-range watch and ideal entry point for anyone who isn't sure how useful a smartwatch will be to them.
Where to get it: Ebuyer (**bit.ly/1TWdojd**)

Deal 4: Alcatel ONETOUCH Smartwatch
RRP: £114 / Deal Price: £108

The ONETOUCH has a 1.22" full-colour circular display, with four different colour and strap combinations and a huge number of features, including fitness tracking, phone control and notification alerts. It's waterproof at depths of up to 1m and has oleophobic coating to minimise grease and fingerprint marks. Compatible with Android 4.3 or iOS 7.0 and above, it has built-in wi-fi for standalone use.
Where to get it: Laptops Direct (**bit.ly/1RmiWp5**)

Deal 5: Sony Smartwatch 3 SWR50
RRP: £150 / Deal Price: £90

This Android Wear smartwatch from Sony haws a 1.6" transflective display that minimises reflection and glare, making it perfect for use in natural light. Fully app-powered, it has a 320x320 pixel screen, 4GB of eMMC storage, voice, touch and gesture input and NFC communication. It's also got a built-in compass and a battery that can power it for two days between charges. All that and the Sony mark of quality and an incredible discount. What's not to like?
Where to get it: Very (**bit.ly/1JLg2l4**)

Microsoft Lifts Lid On Windows Tracking

Solar-Powered Camera Goes Live

Coming to UK in March

Sunny days are hard to come by in this country at this time of year, but keep the faith, people. Especially as, when the sun does decide to make a comeback, you might want to take advantage by taking some memorable snaps of the day – and we've got just the thing!

Combining both the power of the sun and the power of photography in one neat little package, ACTIVEON's SOLAR X action camera provides 4K performance and its own unique solar-charging solution. With a 2" touchscreen, built-in 1100mAh rechargeable battery, 4K video capture at 2160p with a 16MP CMOS video sensor and a seven-element F/2.4 high precision bright glass lens that provides four different levels of field of view, the SOLAR X camera also promises to provide digital image stabilisation and the ability to shoot images with a burst rate of six frames per second.

Chargeable in 60 minutes, battery life, we're told, is up to six hours. There's even a micro HDMI output, which means you can output footage easily to pretty much any display. It's all expected to reach retailers in March this year, but in the meantime you can read more at **www.activeon.com**.

Data includes Edge minutes

A blog over at Microsoft has listed various elements of useage that the Windows 10 operating system is tracking. Stats include the number of minutes spent by users within the Edge browser, the number of photos viewed within the Photo application, times spent by gamers on Windows 10 devices, and how many devices the OS was active on – over 200 million devices, in case you were wondering.

This data is out there as, since Windows 10 was launched, Microsoft has tracked data on its users and how they're using the OS. Worry not about your data being unprotected, though. A spokesperson was quoted as telling the BBC that is it "deeply committed to protecting our customers' privacy" and that the "anonymous" analytics collected allows those working on Windows 10 to make it the "best experience possible".

Let's hope it does that, then.

PIN-Protected Flash Drive

Hardcore security for Kingston's hardware

Kingston has released the latest in its DataTraveler line, the DataTraveler 2000. It's an encrypted USB Flash drive that comes with PIN protection – accessed via its on-board alphanumeric keypad. While it's aimed chiefly at IT security professionals and business users we felt we had to share as, if secure data is your thing, this could well be the portable answer.

Shipping at some point in the first quarter of the year, hardware encryption is of the AES 256-bit variety and is done directly on the drive. That means there's no additional software or hardware drivers required.

Lock the drive with a word or number combination while an auto-lock feature is also activated when the drive is removed from the host device. Ten invalid login attempts put paid to any brute force attempts and an aluminium cover protects the DataTraveler 2000 from those pesky everyday elements such as water and dust.

Available in 16GB, 32GB and 64GB capacities, read more at **www.kingston.com**.

Could we really be about to reach a piracy-free era for PC games? It seems incredibly improbable, but that's exactly what we're being told – and by the very people who enable the piracy in the first place.

Of course, what seems impossible now won't necessarily be so in the future, but if you look at how difficult games consoles have become to hack in recent years, it's clear that the games industry is getting better at securing its products.

If developers can really stop piracy, then, that's fantastic, as long as they don't use it as an excuse to get greedy and increase prices. Assuming they don't, those who download pirated games will soon find there are plenty of legal and, indeed, affordable options, including the numerous and frequent sales in the Steam store.

And perhaps with people buying their games instead of stealing them, we might see a decline in free-to-play titles, which, as far as I'm concerned, rely too heavily on overpriced micro-transactions and other DLC.

Will anti-piracy measures really work, though? Only time will tell…

Anthony

Editor

Meanwhile... On The Internet...

You could debate the worthiness of its content ad infinitum. But as the seventh most visited site on the internet, and the highest ranked non-commercial enterprise (**tinyurl.com/MMnet97a**), it's tough to deny that Wikipedia has been one of the landmark developments of the online age. We'd wager that even among those aware of the potential problems with crowdsourced knowledge (**tinyurl.com/MMnet97b**), there are very few people reading this who haven't availed themselves of its knowledge in the recent past. It may surprise many people that the service turned 15 on 15th January, a landmark that it noted with two significant snippets of news.

The first was a list of the site's most edited articles (**tinyurl.com/MMnet97c**) – a list, you would think, that is based on an interesting equation that balances the controversial and the popular. The most-changed entry is that of George W Bush (**tinyurl.com/MMnet97d**), with the next being one dedicated to World Wrestling Entertainment's ever-changing roster. Barack Obama, Adolf Hitler, Michael Jackson, World War II, Britney Spears and the Beatles occupy other slots – all of which fall into one or both of those categories.

The second piece of news was of a plan to use a million-dollar bequest from software engineer Jim Pacha as the seed for a $100m endowment to help secure the future of the service (**tinyurl.com/MMnet97e**). The Wikimedia organisation hopes to build up the fund over the next decade to "ensure this cultural treasure will never go away", in the words of its 'chief advancement officer',

It's not like the organisation is struggling, though. Despite ever-rising numbers of staff (around 300 now), it had a surplus of over $20m last year, thanks to its successful fundraising efforts and the goodwill of its regular users. It currently has around $65m in its coffers, which enough to see it through this year at least. But it's obvious the Jimmy Wales et al have a much longer-term view on things. That's quite right too. It's quite hard to imagine the world without Wikipedia these days. Where else would we go for amusingly altered biographies – like someone provided for the late, great Alan Rickman upon his passing last week (**tinyurl.com/MMnet97f**).

Of course, Alan Rickman wasn't the only giant of stage and screen to leave us last week. A particularly grim Monday morning – traditionally the day subject to a barrage of 'most depressing day of the year' articles (**tinyurl.com/MMnet97g**) – was made worse by the news that David Bowie had died. The huge outpouring of emotion on social media was not to everyone's taste, though. Indeed, *Times* columnist Camille Long managed to stir up a fair bit of anger (including many NSFW replies) when she questioned the sincerity of the response of Twitter (**tinyurl.com/MMnet97h**). But contrary to her view, the response seemed to be of genuine shock at the passing of a man whose artistic endeavours meant a great deal to a lot of people. And no doubt many people assumed he would, by some modern miracle of science or just his superhuman nature, somehow outlive us all.

As Bowie was well aware (**tinyurl.com/MMnet97i**), we live in a world of data these days. Metrics are everything, so it would have probably pleased him that when many took solace in his music, it was a spike that the modern world allowed us to almost instantaneously track. It equated to his back catalogue smashing Adele's Vevo record for most videos by one artist viewed in a day by some 15 million (**tinyurl.com/MMnet97j**) and a 2,700% rise in Spotify listens (**tinyurl.com/MMnet97k**). This should prove to Ms Long that people were doing more than just paying lip-service to the musician.

Of course, everyone pays respects in their own way. People who had met and worked with Bowie over the years queued up to recall their times together. Many of these you will have seen, but maybe not from the skewed perspective of Conan O'Brian who, like Ricky Gervais (**tinyurl.com/MMnet97l**), remembered Bowie simply as a funny guy (**tinyurl.com/MMnet97m**). Other people just wanted to hear his music, in whatever form that came (**tinyurl.com/MMnet98n**).

Though it's a deliriously hamfisted segue, we'd like to continue talking about statistics – specifically those of Netflix, an organisation notoriously secretive about viewer numbers. It does, of course, have a business model based on subscriptions and people's lethargy when it comes to cancelling (we wonder if any of its execs were previously in the gym business?). So it's no surprise, really, that it's particularly keen to let any of its competitors or, indeed, partners have details on just how many people watch the shows it streams (**tinyurl.com/MMnet97o**). Indeed, it seems to have been consciously thwarting attempts by third parties to come up with any kind of numbers regarding its viewership (**tinyurl.com/MMnet97q**).

For a company with a reputation for delving deep into the data generated by its subscribers and tailoring content to their tastes (**tinyurl.com/MMnet97p**), this is not as perverse at it seems. Why would it share sensitive data that gives its competitors such an insight?

Despite this, NBC claims to have cracked the nut **(tinyurl.com/MMnet97r**) by revealing *Jessica Jones* as the service's top rated show in the US. It will be interesting to see if this revelation leads to an arms race between the service and analysts going forward. Whatever the case, it seems that Netflix is now turning its attention to those using VPN to access its services (**tinyurl.com/MMnet97s**).

.AVWhy?

Videos For Your Eyes... Not Necessarily For Your Brain

Bob Dylan has long been a favourite target for impersonators and comics **(tinyurl.com/MMnet97t)** – even Benny Hill had a punt on *(Please Can We) Go Round Again.* But the current best example is probably Jimmy Fallon. Having parodied his 60s persona in a rendition of the theme to *Charles In Charge* **(tinyurl.com/MMnet97u)**, last week he bought his parody tumbling into the 70s to offer us Dylan's Rolling Thunder/Renaldo persona **(tinyurl.com/MMnet97v)** – complete with mock 16mm grain, whiteface makeup and hat (tinyurl.com/MMnet97y) – taking on Drake's *Hotline Bling*, a song that is already one of the most riffed-upon on the internet in the last year or so.

Even for a man who has an impressive array of musical impressions **(tinyurl.com/MMnet97w)**, including a great take on Neil Young **(tinyurl.com/MMnet97x)**, this was a pretty impressive *Positively 4th Street*-inspired parody **(tinyurl.com/MMnet97z)**. Indeed, if Bob needs material for a new LP, maybe he should consult with Jimmy on where he should look first.

QUICK BITS... According to press reports, over 10% of web users are visiting websites using the new IPv6 protocol

Caption Competition

This neanderthal-looking fellow is not one of our writers, but was the subject of 1395's Caption Competition. Here are the best submissions you, er... submitted.

- **JayCeeDee:** "Okay, great – you've installed the phone. Where's the bl**dy modem!"
- **BullStuff:** "So the voices are NOT in my head?"
- **Thomas Turnbull:** "Hello your through to Caves R Us."
- **BullStuff: "**So, what you are saying, is that this replaces all the cans and all that string?"
- **Ondrive:** "After the stone age came the phone age"
- **The VFM Addict:** "PPI? What the heck is PPI?
- **Thomas Turnbull:** "I'm still trying to book tickets for *Jurassic World*, there's a queue."
- **Frank Everett:** "Who are you? Alexander Graham Bell?!? Sorry, you must have a wrong number."
- **Frank Everett:** "Technology reviewer tries to figure out what this new invention actually does."
- **Thomas Turnbull:** "It seems like I've been on hold since the Stone Age to get through to HMRC."
- **Jim Peters:** "Ug couldn't believe the quotes he was he was getting for his planned cave extension."

Thanks for all your entries, and congratulations to our winner, Graham Lines, who came up with the pun-tastic: "New invention: the tele-stone."

If you have something to say about the picture below (come on, you must have), head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**), or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email subject line.

End Of Line For IE Users

Support stopped on 12th January

Time to upgrade to Internet Explorer 11, everyone. No, it really is, because Microsoft has stopped supporting older versions of its internet browser.

That means if you are currently using one of IEs 7, 8,9 or 10 then you're going to want to upgrade because, as Microsoft wrote in a web post: "Security updates patch vulnerabilities that may be exploited by malware, helping to keep users and their data safer. Regular security updates help protect computers from malicious attacks, so upgrading and staying current is important."

The exception to all this is that is continued support of IE9 for Windows Vista users. Windows 8 support has also ended so users are going to have to upgrade to Windows 8.1 or 10.

Mobile Boost From Kingston

Wireless family gains additions

Another Kingston announcement now. Specifically, it's a boost to its Wireless family of storage readers and chargers in the form of the MobileLite Wireless G3 and MobileLite Wireless Pro products, both of which provide mobile device users with an extra boost on the go.

The MobileLite Wireless G3 has a large 5600 mAh battery that can charge smartphones twice over while its USB port and SD card slot allows users to access files on a USB Flash drive or SC card on a smartphone or tablet wirelessly.

Through the associated mobile app, users can transfer, backup or share photos, videos and other content without the need for a PC and the Wireless Pro device has the same features but 64GB memory built-in alongside a larger 6900 mAh battery. Again, go to **www.kingston.com** for more detail.

Snippets!

IoT Platform Kicks Off

A code-free Internet of Things platform, promising to make it possible for anyone to connect smart devices in any way they like, has launched on Kickstarter. Hoping to raise £25,000, UK startup WiFithing – which debuted its IoT idea at CES 2016 – claims its tech can monitor any sensor and control any electronically-operated device without any need for writing software. Encrypted, and launching with 50 pre-written applications such as setting zone-controlled heating or opening gates, WiFithing should work straight out of the box and the setup automatically builds a bespoke website for each user, allowing for simple 'drop downs' to create smart combinations. Sounds great.

T-Mobile Boss Sorry

The Chief Exec of T-Mobile has apologised for his public dissing of the Electronic Frontier Foundation, posted on Twitter in response to the civil liberty group's criticism of T-Mobile's Binge On feature. The EFF said in a statement that the free video streaming feature is throttling download speeds and T-Mobile head John Legere didn't like that very much. During a Twitter Q&A, he put across his side of the argument in ill-advised, foul-mouthed video response. He's since apologised but, really, it was all a bit unneccessary.

Mobile Networks Out

Users of EE and O2 were affected by network problems on January 11th as a fault on the BT network was apparently to blame for the outages – at least according to O2, anyway.

The networks were up and running again after some hours and all was good with the world again. People do tend to get a bit cross when these things happen though, don't they?

Monkey Copyright Case Put To Bed?

Famous photo comes to court in US

The most famous "monkey selfie" in the world has been the subject of a court case brought forward in America by animal rights group, PETA. The case was brought to light on behalf of the rare-crested macaque monkey that took the famous up-close photo of his face, a photo that was then published in a wildlife book by British photographer David Slater. The camera was Slater's, who left it unattended when Naruto (the monkey) decided to take the snap. PETA argued that Naruto was the owner of the copyright over the photos and that any associated damages should be put towards preserving his surroundings in Indonesia.

The US District judge in this case said that the Copyright Act, which applies in this case doesn't have any indication that it can be extended to animals. In saying that, he's therefore been indicated that he's minded to dismiss the case. PETA is now going to review its options as the judge hasn't yet dismissed its claim outright, instead giving the animal rights organisation a chance to review its lawsuit. PETA is disappointed, obviously, but Slater's lawyer offered a pretty blunt assessment.

"My tuxedo cats could have won this case," he was quoted in the press. "It's not a complicated situation. All that really matters is that the plaintiff is a monkey."

£55 PC For Developing Countries

ARM processor under the hood

PC maker Endless has announced its Endless Mini, a new £55 PC that is intended for markets in developing countries. It comes with an ARM Cortex-A5 processor, 24GB of solid state storage as standard and 1GB RAM. It also features a Linux OS and doesn't have to be connected to the internet, which is why it's possibly such a crucial system for the developing world.

It comes pre-loaded with over 100 apps, some of which provide users with the web's most popular content in offline form – such as a versions of selected Wikipedia articles. This content can also be rendered more up-to-date whenever the system does go online.

This is obviously a possible game-changer for the billions of people around the world who don't have any internet access, or indeed the resources for a more expensive machine. Sounds like a very noble project.

QUICK BITS... Windows 10 has now been installed on no less than 200 million machines around the

Parents Struggle With 'Screen Time'

Kids love their electronics

Survey time. The charity Action for Children is to thank for this poll, which questioned 2,000 parents on the habits of their kids. The results reveal that many are apparently struggling with the thorny issue of 'screen time'. Nearly a quarter of those asked said that they struggled to control their offspring's use of tablets, PCs, phones, games consoles and TVs, compared with just 10% who found homework problematic.

For any mums and dads struggling to know how to get to grips with screen time, the charity has issued some advice, including creating a weekly schedule based on one hour of technology use equalling one hour on other activities, recreating your own childhood activities, and parents turning off their own devices at the same time as the children having no screen time. All quite simple in theory, not so easy in practice.

Star Wars Plot Leak Threat Brings Arrest

Online chat leads to angry response

The seventh instalment in the *Star Wars* franchise, *The Force Awakens*, was quite a big deal upon its global release. In the early days and weeks of its showing in cinemas, many were quite rightly nervous about going online for fear of reading details about the movie's plot – and it's easy to see how people could get really angry about having the story told to them without their permission.

It isn't so easy, however, to understand how such a situation could lead to a threat of violence, such as happened in the American state of Montana where a chap was arrested on suspicion of threatening to shoot a student for telling him some of the plot during an online conversation. As the pair had a heated discussion, one of them posted a photo in which he appeared to be holding a handgun. He also allegedly said that he would come to find him at his school, which was subsequently placed on security high alert. Scary stuff, right?

Razer Supports That Dragon, Cancer

Game proceeds to go to charities

Unique is a word that is thrown around all too freely at times, but this is definitely a title that deserves the label. Ineeded, you may already have heard about *That Dragon, Cancer*, a point-and-click narrative game that retells the four-year battle that young Joel Green fought against the disease and encourages players to immerse themselves in Joel's world.

Joel was given a terminal diagnosis just prior to turning two, and died four years later in March 2014. Thus, the game has partly been a way for his parents Ryan and Amy –to come to terms with their own grief.

Supporting its release, Razer has announced that all proceeds from the sale of the game via Razer Cortex for Android TV will go to two cancer charities based in the US. The reason behind Razer's support is that the game was part-funded by OUYA, which Razer acquired last year.

You can also find the game for yourself over at Steam.

Tesla Promises "Summon" Technology Within Two Years

"Here, Boy!"

Tesla's autonomous car initiative continues to raise eyebrows in tech circles and its high-profile boss, Elon Musk, has now announced that Tesla cars will be able to be summoned by their owners to pick them up within two years.

New software released for the firm's Model S car expands the current Autopilot technology, and also opens the door for owners to be able to summon it, as long as they are within three miles of the vehicle.

And thus, the quest to do even less with our bodies than we already manage drags on.

Epson ET-2550

Inky fingers did not stop our reviewer from testing a new multifunction printer

DETAILS
- **Price: £259.69**
- **Manufacturer: Epson**
- **Website: www.epson.co.uk**
- **Requirements: Windows XP or later Mac OS X 10.6.8 or later**

The Epson ET-2550 is a multi-function printer from the company's Eco Tank range. Rather than using ink cartridges containing 4ml or 5ml of ink, Eco Tank products use ink supplied from bottles holding 70ml of appropriately coloured ink. These bottles should give the user up to two years of printing activity based on an image rate of 200 pages per month.

Pricewise, Eco Tank can offer a considerable savings with regards to running costs. Whereas each 70ml bottle is priced at £7.99, cartridges, often lasting less than a month, can cost around a pound less. Over a two-year period, the saving should work out in excess of £200. There is a downside, as Eco Tank printers have a price premium. The ET-2550 is currently priced at £259.69 on Amazon.

The ink tank container is attached to the side of the standard arrangement of an A4 flatbed scanner mounted on top of the inkjet printer. The presence of this ink tank does add to the footprint required by this device. The ET-2550 has dimensions of 489 x 300 x 169mm (W x D x H).

Filling the ink bottles is not as easy as inserting ink cartridges. You could, as I did, finish up with a couple of inky fingers. But even so, the task could hardly be called difficult and it only needs to be carried out every two years or so.

> **“Eco Tank can offer a considerable savings with regards to running costs”**

The printer is fed paper from an input slot on the top rear of the unit with printed documents ejected from an opening at the front of the box. In both cases, pull-out support arms are available to help with paper management. An adjustable control panel, located on the front of the printer, features a 3.7cm colour LCD screen providing menu options plus feedback regarding status. Buttons for navigation, home, cancel and start are arranged around the screen. Located in the lower-left corner of the printer is a memory card slot for SD cards.

The ET-2550 is not the quickest device with its initial setup process. Including one occasion taking a full 20 minutes, there are a number of interludes where you're kept waiting while checks are carried out. A decision will need to be made regarding a wi-fi or USB connection, with the former supporting WPS for an automatic linking.

The software package supplied with the ET-2550 includes drivers for scan and print plus utilities covering network, Net Print and Easy Photo Print. The A4 flatbed scanner delivers a resolution of 1200 x 2400dpi with images sent to a connected computer or the printer in photocopy mode with an A4 monochrome document taking eight seconds to print, while a colour version required 30 seconds.

The print driver offers Fast, Standard and High modes plus an option to use a slider bar to adjust the balance between speed and quality. Fast mode is only really suitable for internal draft documents, but Standard and High modes produce reasonable quality prints.

mm Michael Fereday

Offers greater savings the more you use it

Gigabyte P34W v5

Performance mobile gaming on the go

DETAILS
- **Price: £1350**
- **Manufacturer: Gigabyte**
- **Website: goo.gl/qpZa5c**

The last time we had a Gigabyte P-series laptop in for review, we were extremely impressed by its performance, build quality and price. That was the P34 v3. This time, we have the newest member of the P-series, the P34W v5.

The list of specifications on the P34W v5 are just magnificent, as they were on the previous generation model. This particular 14" laptop boasts a sixth-generation 3.5GHz Intel i7-6700HQ processor, 16GB of DDR4 memory, a 128GB M.2 SSD and a further 1TB 2.5" hard drive. Installed on the SSD is a copy of Windows 10 64-bit Home Edition

Graphics come courtesy of an Nvidia GTX 970M with 3GB of memory, which helps drive the 14" QHD 2560 x 1440 LCD screen. And in terms of connectivity, there are three USB 3.0 ports, a single USB 3.1 Type-C port, HDMI, VGA, gigabit Ethernet and an SD card reader. Naturally, there's also 802.11 ac/b/g/n wi-fi, Bluetooth 4.1 and an HD webcam included too.

The design of the P34W v5 is very much a Gigabyte standard, with a modern mix of matte-black plastic and aluminium throughout; it may not win any awards, but it looks okay and is perfectly functional. There's a nicely spaced backlit keyboard set in a slightly recessed area, with a large touchpad and button strip below, both of which are responsive and good to use.

The matte-black plastic and aluminium throughout hides a powerful set of internal components

The backlit keyboard is really quite good, responsive and a pleasure to use

It's also remarkably slim, measuring just 20.9mm thick, and at 1.7kg it's not too difficult to carry around either. It's also one hundred grams lighter than its predecessor, the P34W v3, and significantly more powerful too. Indeed, there's a hefty amount of mobile gaming potential here.

Booting into Windows took around 12 seconds. As for benchmarks, the P34W v5 managed to score 6,595 on the 3DMark Firestrike demo. In real-world terms, this means the likes of *The Witcher 3* at high quality in the full 2560 x 1440 resolution had an average frame-rate of around 34, while *Star Wars: Battlefront* at the same resolution in ultra settings managed 48fps, and *Fallout 4* on high settings never dipped too much below 60fps.

The quality of the screen was very good indeed. Thanks to the powerful internal components, there wasn't any sign of the laptop struggling during games. The colours were good, and the image displayed was as close to a top-end IPS panel as you could imagine. Thankfully, the screen seemed somewhat brighter than the previous P34W v3, which is a vast improvement and improves the clarity and sharpness of the visuals.

Battery life while gaming lasted just short of a couple of hours from a full charge. Using it for everyday tasks and watching a video squeezed a tad over three hours out of it, before we needed to plug it back in again. On the whole, that's not too bad. We're talking about a laptop that could put most gaming desktops to shame. At any rate, it's enough brief gaming to last a commute.

Of course, these kind of features and performance don't come cheap. The £1,350 price may seem a little steep for most users, but considering what you get, in terms of the raw power and design, it's not all that bad.

We really liked the Gigabyte P34W v5. It's a wonderfully compact yet extremely powerful laptop. And although it's a little pricey, we think it's worth every penny.

mm David Hayward

Rather expensive, but offers great performance

SanDisk SSD Plus, Ultra II And Extreme Pro SSDs

Mark brings us three SSDs from the same manufacturer

DETAILS

- **Price: SSD Plus 120GB £34.98 (Ebuyer), Ultra II 480GB £114.99 (Ebuyer) Extreme Pro 960GB £299.82 (Ebuyer),**
- **Manufacturer: SanDisk**
- **Website: www.sandisk.co.uk**
- **Requirements: Systems that can use SATA SSD technology**

Normally, my reviews cover one or two products, but today I'm going to bring you three in almost a mini-group test.

SanDisk makes a great range of solid-state storage, and it was kind enough to send out three entirely different designs for me to examine. The entry-level solution is the 120GB SSD Plus, then next is the Ultra II with 480GB, and finally we have the monster 960GB Extreme Pro.

Starting with the SSD Plus, this is certainly a size and a performance that is aimed at people first starting out with SSD technology. It's been built using SanDisk's 19nm MLC NAND technology – interestingly, the same that it uses on the Extreme Pro.

But right from the outset, the fact that the packaging doesn't mention a speed at all should be a warning, because it's plastered over the boxes of the other two products.

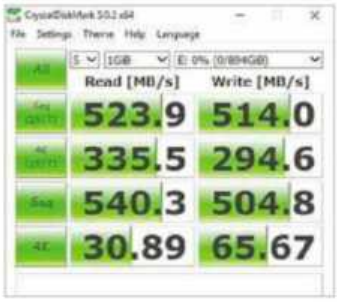
Read speed is very good indeed, and in testing I exceeded the 550MB/s that SanDisk quotes online. But writing is a much less exciting experience, with a quoted speed for the 120GB model of just 180MB/s. I managed 211MB/s, but that's still only a bit better than a decent physical drive and half what the 240GB version of this model can achieve.

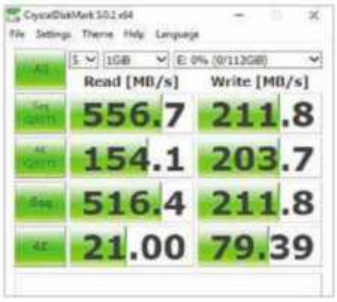
There aren't any official IOPS scores for the SSD Plus, but I'd put it in the 37K read and 49K write ballpark.

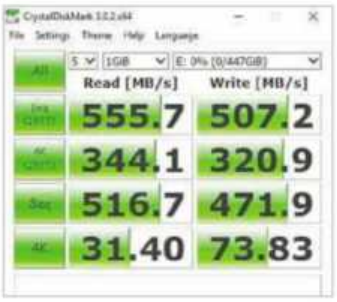
That larger 240GB SSD Plus is about £60, and given the 350MB/s write speed, it's clearly superior if you can afford the extra.

On paper, the Ultra II is remarkably similar to the SSD Plus, in least in terms of shock resistance and flash memory endurance. Instead of quoting a total bytes written, SanDisk rates both drives with an operational endurance of 1.75

	SSD Plus	Ultra II	Extreme Pro
Cost Per GB	29p	24p	31p
Capacity	120GB	480GB	960GB
Quoted Sequential Read/Write	500/180MB/s	550/500MB/s	550/515MB/s
Benchmarked Sequential Read/Write	557/211MB/s	556/507MB/s	524/514MB/s
Random Read/Write 4KB QD32 IOPS	N/A	98000/83000	100000/90000
Warranty	3 years	3 years	10 years
Score			
Quality Out Of 10	6	7	8
Value Out Of 10	6	8	7
Overall Out Of 10	6	8	7







million hours. That's just less than 200 years for those with unrealistic life expectancy.

The Ultra II is radically different in the way that the flash memory is built and organised, using the Marvell 88SS9189/88SS9190 controller, 128Gbit 19nm TLC with nCache 2.0 and Multi Page Recovery tech. That allows it write at speeds that even the 240GB SSD Plus would blush at.

SanDisk makes the Ultra II in 120GB, 240GB, 480GB (reviewed here) and 960GB capacities. All of them are rated at 550MB/s reading and 500MB/s writes, and they only really differ on IOPS delivered.

The Ultra II 480GB review drive delivers a very healthy 98000 IOPs random reads and 83000 random writes, making it trade blows with many of the older premium products from late 2014 and even early 2015.

Along with read speed, value is probably the strongest aspect of the Ultra II, being about 24p a gigabyte, compared to 29p for the SSD Plus 120GB model.

The combination of cost and performance makes the Ultra II an attractive proposition, especially if you're looking for something better than an entry-level device. The other advantage of this drive is that at 480GB capacity it's likely to be much less challenging to move to from a hard drive, unless you've got a 1TB that's entirely full.

Those with that problem need to consider the Extreme Pro in this selection, because the 960GB capacity is more data than most people have on a laptop.

What's slightly curious about my benchmarking of the Extreme Pro is that it isn't the fastest read, though it is the quickest at writing overall. It's also very impressive from an IOPS perspective.

Built using 64Gbit 19nm MLC, it features a minor upgrade to the nCache 2.0 technology used in the Ultra II. Plus it has some tweaks that makes it very reliable.

It comes in 240GB, 480GB and the 960GB versions. Depending which size you go with, you might be paying £89.99, £148.98 or a rather bruising £299.82. That makes the 480GB the best value at 31p per gigabyte, with the 960GB only fractionally more expensive. At 37p per gigabyte, I'd avoid the 240GB model if you're looking for the best price performance in this range.

SanDisk provides a TBW (terabytes written) of 80TB, which, given a typical write of 40GB per day, would last you more than five years of abuse, if you never took weekends or holidays off. It also has a ten-year warranty, underlining SanDisk's belief that it won't fail early on in its lifespan.

In most other respects, like shock resistance and working temperatures, the Extreme Pro doesn't offer anything dramatically enhanced over the SSD Plus and Ultra II, so it really comes down to how much performance and reliability you're prepared to pay for.

Of these products, I'd avoid the 120GB SSD Plus for reasons I've already mentioned, and of the other two, I'd buy two 480GB Ultra II drives and use them in RAID 0 for optimal performance, 960GB capacity and the best per gigabyte price.

mm Mark Pickavance

Reasonable SSDs for all needs and pockets

Brother DCP-J562DW

Michael takes a look at a multi-function device from this company's new range

DETAILS
- **Price: £103.20**
- **Manufacturer: Brother**
- **Website: www.brother.co.uk**
- **Requirements: Windows XP or later / Mac OS X 10.8.5 or later**

The DCP-J562DW is a Brother multi-function device aimed at the home user. Offering the usual mixture of print, scan and copy functionality, this product gives you a choice of USB or wi-fi connectivity, plus support for various remote print services.

Best suited to a home office environment, it has dimensions of 400 x 341 x 181mm (W x D x H). The layout of the unit follows the usual pattern of an A4 flatbed scanner placed on top of an inkjet printer. This is then mounted on a paper tray, which combines a capacity of 100 sheets of copy paper with an integrated photo tray holding up to 20 sheets of photographic paper. There's also an option to manually feed a single sheet of paper through a slot at the rear of the printer when the occasion arises for special paper for a specific job.

Mounted on the front of the printer is a control panel, adjustable to various angles to help with visibility in different lighting conditions. A centrally positioned 6.8cm touchscreen provides you with the means to switch between features such as copy, scan, photo printing, settings and ink levels. I felt that this screen was not particularly sensitive and required a degree of pressure before it would respond. Arranged around the screen are various touch-sensitive buttons, which are more responsive.

Positioned on either side of the front of the printer are concealed compartments. The compartment on the right side houses the four inkjet cartridges, covering black, yellow, magenta and cyan. The left-side compartment features slots for SD and MMS memory cards holding images for printing.

Setting up the product is reasonably straightforward, with a wizard on the supplied CD leading you through the process. There was a minor hiccup that was resolved by establishing a wi-fi link from the unit direct to my router rather than that offered by the supplied software. Along with the necessary drivers, you get Brother ControlCenter4 and Nuance Paperport 14SE with OCR.

The A4 flatbed scanner delivers a resolution of 1200 x 2400dpi optical or 19200dpi interpolated. Scans can be directed to the printer for photocopies or as attachments for email and web services plus storage on the host computer. Print speeds for A4 scans were impressive at around four seconds for monochrome and five seconds for colour.

When printing documents, you have a choice of Fast, Normal or Best, with the former only being suitable for internal use. I would be happy to use either of the other two modes for most general tasks. Print speeds for the various modes are shown in the table below. Larger documents can take advantage of the duplex print mode to save on paper. Switching to photographic printing required an adjustment to be made to the paper tray, so the integrated tray became the default source. The produced images were reasonable but less impressive with regards to speed. I opted to use the memory card slots for the source material. A 10 x 15cm image took two minutes and 46 seconds, while an A4 print required six minutes and 43 seconds. In both cases, the printed images were borderless.

Replacement cartridges are priced at £16.79 for black and £9.59 for each of the three colours.

mm Michael Fereday

Reasonable image quality but photo printing could be faster

Speedlink Medusa 5.1 True Surround Headset

Because you wouldn't want any false surround now, would you?

DETAILS
- **Price: £41.99 from Amazon**
- **Manufacturer: Speedlink**
- **Website: goo.gl/LBSv6c**
- **Requirements: Windows XP or later, USB port**

How much difference does surround really make? I've had my fair share of surround systems, and certainly when it comes to movies and TV, I'd much rather have a good set of stereo speakers and a strong subwoofer, because I honestly don't care if I can hear helicopters flying over my head while I'm watching *Die Hard*.

However, gaming is a different matter entirely. There's a strong argument for having audio coming from all directions in a medium that puts you right in the middle of a 3D environment and where you can look all around you. If you can hear an enemy coming from behind you, then it makes sense that you might gain some kind of tactical advantage that you wouldn't get with stereo.

Of course, not everyone wants to share the noise of their frag sessions with the rest of the world, so 5.1 headsets like the Speedlink Medusa are a tempting proposition. The question is: how good are they?

With the Medusa, first impressions are positive. Before you've even plugged this headset in, you might well be impressed with its sturdy build quality, which belies its budget price. The way the earpieces twist and fold in is the kind of thing usually reserved for more expensive products, so Speedlink should be commended for including such features here.

The padding around the earpieces and on the headband is soft and reasonably comfortable too. However, the earpieces are also rather small, and some users might find they press down on their earlobes, rather than surrounding them.

I also have my doubts about the leather-effect covering. It seems more than a little flimsy, and I suspect it's likely to peel away in a matter of months. Perhaps that's why Speedlink included an extra set of earpads, which come in a snazzy red colour, as opposed to the standard black ones.W

Whether or not this is the case, for a headset costing just over £40, the Medusa offers far more than I was expecting. The sound quality is surprisingly good, with clear treble and good, undistorted bass response.

You can also use the large control unit built into the cord to raise and lower the levels for the Medusa's front, centre and rear speakers and the subwoofers, as well as adjusting the overall volume. Listening to music from Spotify, only the front speakers worked, which is a little disappointing, because it would have been desirable to hear the bass coming out of the sub channel. Regardless, the bass sounded well balanced and was comfortable to listen to.

In 5.1 mode, however, this headset truly comes alive. This is when the sub kicks in, and when you start hearing all five channels. And best of all, it really works, so yes, you can hear choppers flying over your head in *Die Hard* if you absolutely must (I don't actually remember if there are helicopters in this movie, but I'm guessing there must be). Even for someone with his doubts about surround sound, I have to admit the audio produced by the Medusa when watching TV or films is impressive.

But does it work in games? Yes, but also no if you're running Windows 10. On a recently upgraded system, I found that in some of the titles I tested the headset with, I could only get stereo sound, meaning only the front channels again, while in others, such as *Fallout 4*, full surround sound was implemented automatically. And in various 5.1 test videos on YouTube, I could get all five channels but nothing from the sub. I was, however, using the drivers automatically provided by Windows 10, because the ones supplied by Speedlink at the time, both on disc and online didn't work with this operating system. A few days later, I did notice some beta Windows 10 drivers on the Speedlink site, but unfortunately, I didn't have any luck with them either. Thankfully, on a Windows 7 machine, these same videos played perfectly, and every channel, including the sub could be heard. Oddly, though, in both versions of Windows, the surround sound test in the Windows Sound control panel indicated that all channels were working.

Such problems might be a deal-breaker if it weren't for the overall sound quality and the appealing price. As it stands, the Medusa headset offers great value and more than competent performance.

mm Anthony Enticknap

A good headset at a great price

Recreated ZX Spectrum

We get to review an old favourite, again

DETAILS

- **Price: £99.95**
- **Manufacturer: Elite/Ceratech**
- **Website: goo.gl/CUKAqs**
- **Requirements: Bluetooth device to pair with, Recreated ZX Spectrum app for Android, iOS or the main site web app**

➤ The Recreated ZX Spectrum, in all its rubbery keyboard glory

➤ Using the Recreated Spectrum via the accompanying app is nostalgic heaven

It's fair to say that I have a bit of a soft spot for the ZX Spectrum. It is, after all, the first computer I ever owned and what got me into this whole crazy technology world I now work and play in.

I therefore followed with great interest the Kickstarter project from Elite, back when it was first launched in December 2013 – even when the project stalled due to unpaid royalties to some developers of the games featured. It's been a bit of struggle for the team behind the project to finally get the Recreated ZX Spectrum to the desktops of the backers, but despite some bad press from certain quarters, it's finally here. And we now have a valid excuse to re-play *Chuckie Egg*.

First off, the Recreated ZX Spectrum looks, feels and even smells like the original machine. The dimensions are precise, and even the weight is a few grams within the parameters of this much loved 80s home computer. The rubber 'dead flesh' keys are beautifully remade, complete with the Symbol Shift, Caps Shift, Graphics and multiple commands per-key that we once knew like the backs of our hands.

The case bears the same colours, with the iconic Spectrum rainbow stripe along one side, and the raised, plastic moulded top with Sinclair and ZX Spectrum logos. After that, though, the rest of the Spectrum is a purely 21st century affair.

Where the rear of the original featured the 9VDC, expansion, Mic, Ear and TV ports, this modern creation instead has a power switch, status LED, Pair button, Layer A and B switch and a 5V DC micro USB port, together with a battery compartment on the base for a couple of AA rechargeable batteries.

The Pair button is pretty self-explanatory, since this new Spectrum is essentially just a Bluetooth powered keyboard. The Layer A and B switch, however, changes the state of the keyboard when the Spectrum is connected to a PC, these options being a Game mode and a QWERTY mode. The difference is in the Game mode, keys 1 through to 0, D and Enter are available. In the QWERTY mode, the Spectrum keys can be unlocked and used as a traditional keyboard on a PC.

Out of the box, the Spectrum is a novel, if somewhat expensive, Bluetooth keyboard. To get the best from it, you'll need to connect it to either an Android or iOS device, or to a PC running the Recreated Spectrum app or online web app.

The app opens up the Recreated Spectrum, along with a collection of games, such as *Chuckie Egg*, *Manic Miner*,

Saboteur, *Scuba Dive*, *Thanatos* and even access to 48K and 128K BASIC – along with instruction on how to play or use them. There are many more titles – 50 to be precise – which each cost 70p.

Interestingly, we did manage to get it working as a fully blown Bluetooth keyboard on our PC while using Spectaculator. Unfortunately, the keys were mapped incorrectly – the PC thinking that it was a traditional UK Bluetooth keyboard. However, it did work, and again that opens up a more realistic retro gaming experience, especially if you have countless Spectrum images on hand.

Through the app, though, the emulation of the games is flawless. And equally, the interaction between the Recreated Spectrum and the app and game is perfect. Trying to find the right balance between modern connectivity while recreating the nostalgia is something that many modern retro consoles fail to do with any degree of accuracy. With the Recreated Spectrum, though, everything from the build quality to the app itself is absolutely wonderful.

The design is perfect, recreating every curve and colour precisely

Even the packaging takes us back

The fans of the original machine are undoubtedly going to be the hardest to please and probably the ones who will ultimately be purchasing the device in the first place. There are no doubt younger retro fans too, but in all honesty we can't see a modern teenager opting to spend £99 of their own money to play a 30-year-old platform game. For the 40-plus retro gamer, we think the Recreated ZX Spectrum beats the rival ZX Spectrum Vega model. But it is a niche device for a niche set of users.

The biggest hurdle for Elite and the companies involved in the production of the Recreated Spectrum is the addition of more games to the database. The company does hope to have several hundred available within the coming year, but getting hold of licences and so on could well be an impossible task.

Of course, there will be some cases where your favourite game may never appear, *Barry McGuigan World Championship Boxing* might still be something we play through Spectaculator or the original Spectrum and tape, but it would be nice to see developers and publishers putting their forgotten titles forward.

Ultimately, the Recreated ZX Spectrum is a fan's dream come true. It's a fantastic, well-designed and well-engineered device that looks great even through the rose-tinted hue of nostalgia. Where it goes from here will be interesting, and we're be looking forward to a splendid year of 80s gaming.

mm David Hayward

An amazing recreation of our childhood memories

GROUP TEST

27" Gaming Monitors

Although the average monitor can be used to play games on, a gaming monitor will bring out far better details and cut out some of the annoying tearing and lag you may experience with a non-gaming screen.

This week, we have six such displays to test. Which one should you be adding to your setup?

Acer G276HLA

DETAILS
- **Price: £154**
- **Manufacturer: Acer**
- **Website: goo.gl/zl3zBL**
- **Requirements: Basic video outputs, HDMI, VGA, DVI, OS independent**

the Acer G276HLA, a pretty basic monitor but one that's good for casual gamers

Acer has a pretty good standing in the home computing environment. Its monitors are priced competitively and offer the user a taste of some of the better monitor technologies without you having to opt for a more expensive model.

The Acer G276HLA is one of the mid-range examples from the company, before the feature list starts to get a little more niche.

It's a 27" TN panel with a decent 2ms response time; HDMI, DVI and VGA inputs and a dynamic contrast ratio of 100,000,000:1. Viewing angles are 170° on the horizontal and 160° on the vertical, which aren't up to IPS sort of standards but are good enough for the average gamer.

The build quality is okay; there's a 0.5" glossy bezel around the screen, which isn't great but not too distracting, with the OSD controls located in the bottom right-hand corner together with the power. Connectivity around the back of the monitor is easily accessible ,and there are the relevant holes for VESA mounting, should you wish – although if you're doing that, you'd probably prefer the video inputs to be facing down rather than straight on as they are in this case. Overall, it's certainly sturdy enough to sit on a desk and take a few knocks for the remainder of its lifespan.

The included stand is a four-point cross that slots up into the bracket around the back of the monitor, which is then screwed in place. This makes it quite a solid foundation, while not impeding the monitor's adjustable angle. It's also surprisingly light, weighing in at around 4.5kg with the stand, which isn't too bad considering it's not the thinnest panel we've ever come across.

> **"A bright, clear monitor with great colour reproduction"**

We found the G276HLA to be a bright, clear monitor with great colour reproduction. The 2ms response time is good enough for playing games or watching video, but it also means there's very little eye strain when spending long hours in front of a Word document or image editing package.

Having said that, the Acer G276HLA is, on paper, a fairly average monitor. What lifts it slightly is the price. The addition of a USB hub and a set of speakers wouldn't go amiss; naturally this would bump up the price considerably, but it would save you from having to buy an extra USB desktop hub to replace the handy ports you get with a USB-enabled monitor. Also, we found the OSD buttons to be a little fiddly and difficult to locate properly, especially when you only have a few seconds to press the correct button before the OSD powers off.

It's a good-quality monitor with a large screen, enough connectivity for the average gamer and at a reasonable price to boot. It won't win any awards, but it'll do the job.

BenQ RL2755HM

DETAILS
- Price: £199
- Manufacturer: BenQ
- Website: goo.gl/nKnys3
- Requirements: Basic video outputs, HDMI, VGA, DVI, OS independent

Moving on to a more gaming-focused monitor, we have the BenQ RL2755HM. BenQ has been busy in recent months putting the finishing touches to its range of gaming panels, and the result is something quite impressive.

Although the RL2755HM isn't the company's top-of-the-range model, there's plenty to like about this monitor. The full HD TN panel measures 27" and offers a 1ms response time, brightness levels of 300cd/m2 and viewing angles of 170° horizontal and 160° vertical. Connectivity comes in the form of a pair of HDMI ports, DVI and VGA, as well as a headphone input and line-in ports for the pair of 2W speakers.

The matt-black finish limits the amount of glare and fingerprints and is coloured with splashes of red here and there for a more dynamic effect. It's not too flashy, and thankfully there's nothing to distract your attention away from the action on the screen. Incidentally, the base is angled slightly, with a rubberised strip at the top to rest one or more controllers on, and around the back of the screen there's a flip down section to store your headset. Little details, yes, but significant ones for the avid gamer.

There are some good gaming features

It's well priced but lacks higher resolutions and USB

The proof, though, is in the testing, and happily the RL2755HM didn't disappoint. There was no perceivable lag or motion blur. Any genre of game or fast action movie will look great when played on this monitor, and to emphasise this, BenQ has also included a couple of dedicated gaming profile picture modes for FPS and fighting games. These settings will alter the calibration of the colours and improve the sharpness of the screen to help you see more during play.

On top of this, there's also a Black eQualizer mode to brighten darker scenes without overexposure, and there's a 20-level Colour Vibrance setting to help optimise the details on screen.

The output without the touches is fantastic; in fact, it's one of the best, most colour rich and sharp we've seen in a long time. However, there are a few elements that would make for a better gaming monitor. For one, there's no USB connectivity. It's a minor detail, but since this is a gaming monitor, perhaps the addition of a couple of USB ports, just for charging wireless controllers perhaps, would have sweetened the deal.

Secondly, there's no DisplayPort connection. Again, you could argue that it's not necessary, since there are already a pair of HDMI ports, but a lot of graphics cards are now pushing finer details through DisplayPort, and there's always an opening there to accommodate Nvidia G-Sync technology. And finally, it's not the most ergonomic of monitors in that there's only a slight tilt available. If perhaps a height adjustment could be added, for better positioning, then this would easily be the best gaming monitor we've ever used.

BenQ XL2730Z

DETAILS
- Price: £450
- Manufacturer: BenQ
- Website: goo.gl/ZhlYBh
- Requirements: AMD GPU for best features

Our next BenQ is the top-of-the-range XL gaming series of monitors. As you'd expect, it has pretty much everything you could ever hope for as a gamer, but at an average price of £450, is it too much?

This LED 27" TN panel is a professionally designed gaming screen that's capable of a maximum resolution of 2560 x 1440, at 144Hz and offering an excellent 1ms response time.

There's support for FreeSync AMD Radeon cards, to eliminate screen tearing; BenQ's own motion blur reduction technology; and 20-level colour vibrancy settings. And you'll also find the highly acclaimed BenQ eQualiser technology, as we've seen in the other BenQ example.

One of the major features of this model, though, is its impressive ergonomic design. There's a fully adjustable-height stand, with measured red-coloured scale indicator for 14 settings, along with a scale for the screen tilt and swivel. It's a commendable addition and something that's sadly missing from many monitors – let alone gaming displays.

The XL2730Z also features a wired remote puck-shaped control that will bring up the on-screen menu, with five buttons surrounding a scrolling wheel; it even has an indented docking space built into the monitor stand. Furthermore, there's a pull-out headphone hook, a carry handle at the top of the stand and a large hole at the bottom of the stand to keep those annoying cables as tidy as possible.

The BenQ XL2730Z is a great gaming monitor

The problem is it's quite expensive

The XL2730Z's connectivity is superb, offering a pair of HDMI ports and single DVI, DisplayPort and VGA inputs. There's a mini-USB port for the remote to plug into and a further USB type-B input for the side-accessed two-port USB 3.0 hub (just below the headphone retractable hook).

The screen quality is very good, certainly more than enough for the dedicated gamer. Admittedly, though, the viewing angles aren't quite as good as a monitor with an IPS screen, likely since this is a TN panel. However, once you angle the monitor to your particular preference, the image displayed is colourful, vibrant and, when used in conjunction with the eQualiser technology, it really brings out the superb visuals in any game, photo or video.

The FreeSync AMD technology certainly works a treat. We noticed that sections of the cut-scenes in *Assassin's Creed: Syndicate* had some tearing on a standard monitor setup and even in the previous gaming monitors in this group so far. But with the FreeSync active through the DisplayPort, everything was smooth.

Naturally, the FreeSync technology was a good move on the part of BenQ, since the technology has no licensing fees, proprietary hardware modules or communications overhead. Nvidia users, though, don't miss out either, since this is a more than capable and fast-response monitor.

This is an excellent gaming screen, but £450 is a little steep for most average gamers. The avid and regular gamer could possibly justify the cost, and they'll enjoy the benefits without a doubt, but it's still rather expensive.

Philips 272G5DYEB

DETAILS
- Price: Around £380
- Manufacturer: Philips
- Website: goo.gl/2nehgB
- Requirements: GPU with DisplayPort out or a converter, Nvidia GPU for best results

▲ *The Philips 272G5DYEB is a pretty impressive monitor*

▲ *It's another pricey screen, so be prepared to pay big*

Where BenQ has adopted the AMD FreeSync technology, the rival Nvidia G-Sync monitors are fast gaining ground. For those of you who aren't familiar with G-Sync, it's a hardware module that will synchronise with an Nvidia GPU to eliminate any screen tearing, stuttering or artifacting when playing games or watching fast action movies in higher resolutions.

You'll need an Nvidia 650GTX or better to take advantage of this communication between the monitor and GPU, and it'll only work via a DisplayPort 1.2 connection, but the benefits of G-Sync are impressive.

The Philips 272G5DYEB is a 27" TN panel with a non-reflective coating, a brightness level of 300cd/m2, a maximum resolution of 1920 x 1080, a response time of 5ms, a SmartResponse time of 1ms and a typical contrast ratio of 1000:1.

To add to that there's also a 144Hz refresh rate and Nvidia Ultra Low Motion Blur, plus it's Nvidia 3D Vision ready (you'll need the glasses, though). The height can be adjusted to 150mm, with pivot to 90°, swivel from -65° to +65° and tilt from -5° to +20°. Plus the viewing angle is an impressive 170° horizontal and 160° vertical. As if that wasn't enough, there's also a four-port USB 3.0 hub built into one side of the monitor.

> **"The colours were bright and vibrant, and everything was sharp, clear and focused"**

The SmartResponse feature is a Philips technology, one that will automatically adjust the response times for a specific application, such as gaming. The result is better viewing all round, and we have to say we were impressed with what we saw.

Using the *Assassin's Creed: Syndicate* example from the BenQ XL2730Z instance, the combined use of the G-Sync and SmartResponse technology proved to be quite exceptional. There was no perceivable screen tearing, screen lag or anything else that would indicate an insufficient response time.

In terms of the output quality, the colours were bright and vibrant, and everything was sharp, clear and focused. It was a treat for the eyes and one that we're sure gamers will appreciate.

The Philips 272G5DYEB is an impressive monitor, but the one factor that we don't particularly like is that there's only one input: a single DisplayPort. Although this technology allows for G-Sync and so on, it's rather odd leaving other games out in the cold with the lack of DVI or HDMI, especially since this monitor costs around £380.

It's quite an omission of technology, as you'll need to a converter or a DisplayPort-enabled graphics card, which can increase the overall cost of the entire system. Still if you own both and it happens to also be a compatible Nvidia card, then you'll be very happy with what the Philips 272G5DYEB has to offer.

Asus ROG Swift PG278Q

DETAILS
- Price: £530
- Manufacturer: Asus
- Website: goo.gl/Ewv9RZ
- Requirements: GPU with DisplayPort out or a converter, Nvidia GPU for best results

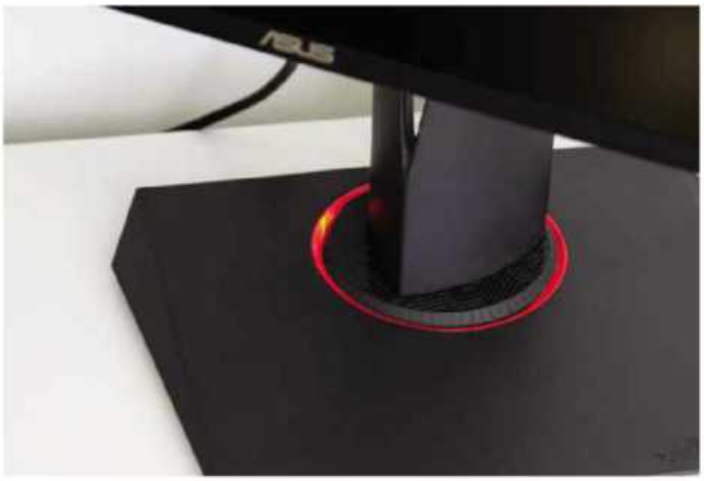
The Asus Republic Of Gamers (ROG) Swift came out last year in line with the higher-end gaming PCs and peripherals that were launched at the same.

It was one of the first monitors to combine G-Sync with a 144Hz refresh rate and a WQHD panel, and it has received its fair share of positive attention. But how does it compare after a year on the market?

As we said, it's a 27" WQHD TN panel with a maximum resolution of 2560 x 1440, a contrast ratio of 1000:1 and a 1ms response time. The 144Hz and G-Sync technologies finish off the more impressive looking specifications for the panel.

In terms of connectivity, the Asus ROG Swift is another monitor that features a single DisplayPort 1.2 connection. Again this is due mainly to the G-Sync technology, but as we mentioned in the review of the Philips monitor, it severely limits the userbase by omitting HDMI and even DVI and, if we're being picky, legacy users or those who run more than one machine through a single monitor. Once more, though, it's worth noting that if you have a DisplayPort Nvidia graphics card, then you'll be perfectly happy with the connectivity on offer.

The Asus ROG Swift is another excellent gaming monitor



There are some neat touches, but £530 is a lot of money

In addition to the DisplayPort, the Asus ROG Swift does have a two-port USB 3.0 hub located under an angled section at the rear of the monitor. It's not as easy to get at compared to a side-mounted setup, but it's functional and works fine if the monitor is going to be VESA wall mounted.

The design of the monitor is good, with a thin bezel around the screen, a large wedge-shaped base complete with a glowing LED ring around the base of the monitor arm and where it fits into the base. There's also height adjustment, along with tilt from -5 to 20°, swivel and pivot.

As for the screen quality, the Asus ROG Swift is very good indeed. It's on a par with the quality of the Philips and BenQ XL2730Z models, with more emphasis on the Nvdia G-Sync technology that the Philips monitor also uses. It's a superior gaming monitor compared to the average screens you can find almost anywhere.

There is one aspect of the gaming specification that we did like, and that was a dedicated hot key as a part of the OSD setup that allows you change the refresh rate from 60Hz to 120Hz and on to the maximum 144Hz. It was easy to locate, being placed around the back right-hand side of the monitor and easy to scan between the selected rates. Incidentally, there's also a five-way joystick-like navigation key above the hot key to help you move around the OSD – another decent feature.

The Asus ROG Swift PG278Q is a great monitor. There's plenty of technology for the gamer and it has a fantastic output as well. The only problem we have is the lack of other inputs and the price.

Iiyama ProLite GB2773HS-GB1

DETAILS
- Price: £300
- Manufacturer: Iiyama
- Website: goo.gl/OJRAqG
- Requirements: Basic video outputs, HDMI, VGA, DVI, OS independent

The Iiyama ProLite GB2773HS is priced a little too high for what it offers

Its features aren't too bad, though

Iiyama monitors were once regarded as the cream of the crop and it was difficult for any other manufacturer to even come close to the level of quality. However, that was in the old CRT days, and things have changed a lot in the industry since then. It'll be interesting to see if Iiyama can hold on to its crown.

The GB2773HS-GB1 is a 27" TN LED backlit panel, with a dynamic contrast ratio of 5,000,000:1 and a resolution of just 1920 x 1080. The monitor is a little old for the likes of Nvidia G-Sync or AMD FreeSync, but the 144Hz refresh rate certainly makes up for a lack of such GPU technology.

Connectivity on this model is good, with single HDMI, DVI and VGA ports, as well as 3.5mm audio in and headphone out. That's enough, granted, but it's lacking DisplayPort, which could present a problem for some users. At least in this case legacy kit can be connected without any problems.

The design of the GB2773HS-GB1 is okay, but there's rather a thick shiny/glossy black bezel surrounding the screen that tends to distract somewhat. Despite the bland design, there are plenty of ways to tweak its physical orientation. It's height adjustable, to a maximum of 107mm; it can swivel 45° both left and right; and it can tilt 17° up and down.

We did find the monitor casing to feel a little cheap, and the OSB menu buttons, located on the front of the monitor in the lower right of the screen, seemed to need a couple of firm presses before they actually decided to work.

> "It wasn't as sharp or as vibrant as the other monitors on test"

In our tests, the Iiyama ProLite GB2773HS-GB1 didn't fare quite as well as the competition. The image quality was certainly good, but it wasn't as sharp or as vibrant as the other monitors on test. Even the cheaper Acer appeared to produce some better visuals over this panel. And when placed next to both the BenQ monitors and the Philips and Asus models, the poor Iiyama appeared to be pretty poor.

The Iiyama Prolite GB2773HS is admittedly nearing the end of its shelf life, with the company now pushing the newer Black Hawk gaming models in favour of the previous-generation ProLite examples. It is, however, still available and thus open to review as much as the other models on test.

We also feel that the price of around £300 is too steep for this monitor, especially considering its age and the fact that you could have two Acer monitors – of better quality – for the cost of a single GB2773HS.

BenQ RL2755HM

The BenQ RL2755HM does lack a few features that the more expensive models have to offer, but for the price and what you get, this is a really good gaming monitor.

It may not have the highest resolutions or USB, but to a gamer it's more than capable of delivering superb quality visuals.

BenQ XL2730Z

Okay, £450 is a lot of money for a single monitor. But compared to the other higher priced monitors on test, it's not quite as bad as it sounds.

Considering the level and amount of technology you get, and especially if you're using an AMD GPU, you'll get a far superior gaming experience with this screen.

How We Tested

Each monitor was hooked up to an Intel Core i7 PC fitted with an Nvidia GTX970, 4GB of memory and an R9 390 Gaming GPU with 8GB of RAM. For gaming we ran *Elite Dangerous*, *Assassin's Creed: Syndicate*, *Battlefield 4* and *CS:GO*.

	Acer G276HLA	BenQ RL2755HM	BenQ XL2730Z	Philips 272G5DYEB	Asus ROG Swift PG278Q	Iiyama ProLite GB2773HS
Price	£154	£199	£450	£455	£530	£300
Resolution	1920 x 1080	1920 x 1080	2560 x 1440	1920 x 1080	2560 x 1440	1920 x 1080
Static Contrast Ratio	1000:1	1000:1	1000:1	1000:1	1000:1	1000:1
Dynamic Contrast Ratio	100,000,000:1	20,000,000:1	12,000,000:1	10,000,000:1	10,000,000:1	5,000,000:1
Response Time	2ms	1ms	1ms	1ms	1ms	1ms
Weight	4.60kg	5.5kg	7.5kg	7.80kg	7kg	7.4kg
HDMI	1	1	2	0	0	1
VGA	1	1	1	0	0	1
DVI	1	1	1	0	0	1
DisplayPort	0	0	1	1	1	0
USB	No	No	Yes	Yes	Yes	No

Top 5 Unwritten Rules Of Social Networking

None of these are in the T&Cs, but they're probably even more important...

1 Don't Drunk Post

Social networking has become completely entwined into the daily lives of many people; every time they have an interesting thought, see something they like or eat something particularly tasty, they share it with their friends and family – or even with complete strangers. Of course, when you've had a few too many to drink, pretty much everything can seem worthy of sharing with the world, whether that's the sublime, the mundane or – more dangerously – the completely inappropriate. Yes, that risque or edgy joke might sound good in your head after you've had your fifth Babycham of the evening, but once you've sobered up and your better judgment has returned to full control of your body, you might wish you'd left your phone at home.

2 Don't Be Friends Your Boss

Working your way up the greasy corporate pole is an arduous task at best, so it seems like a reasonable plan to ingratiate yourself with the upper management. What better way than to add them to your Facebook or Twitter friends, so you can get all chummy and perhaps drop hints about that promotion/pay rise/company car you're after? It sounds good in theory, until later down the line you forget about it and, after an especially tough day in the office, you return home and declare to the world that "My job sucks and my boss is a moron!"

Also, as we've mentioned, imbibing alcohol increases your chances of saying something stupid – not ideal if you're trying to impress your superiors.

3 Don't Share Everything

If you're on a social network, then at some point, you'll have seen someone share a post that says something like "If you agree with this, share it." And for some reason, people feel obliged to do as they're instructed, regardless of how inane it is. Not everyone is so easily led, however, and just being told to share won't make them do so. But give them something to feel smug about, no matter how small, and they'll be clicking the share button in a flash. "Can you think of a vegetable that doesn't have the letter 'a' in it?" they ask. "Yes!" hundreds of people declare, as they joyously type "Swede", "Beetroot" or one of the many other possible answers to this deliberately easy challenge. Meanwhile, the person who posed the question is either gathering everyone's details or just having a good laugh at their expense.

4 Don't Believe Everything

"When you're alone and life is making you lonely," Petula Clark sang in 1964, "You can always go, downtown." Or if it's a bit rainy outside, you can online instead and cheer yourself up by getting really, really angry about stuff. Like the fact that a big fast-food chain has been making burgers out of short people, or a prominent politician once killed a man with a plastic spoon and got away with it by being rich and powerful. Does it matter whether any of this is actually true or not? Apparently, it doesn't, because falsehoods and lies spread around the web faster than the cold virus does around a tube train on the Northern Line. Our advice? Be skeptical of everything, and check sites like **www.snopes.com** or **www.hoax-slayer.com** if you're in doubt.

5 No Game Requests

Thankfully, it's become far more easy to block Facebook messages from terrible casual games, but wouldn't it be nice if everyone just stopped sending them in the first place? Of course, that's never going to happen, because the people who send you these requests have been offered some kind of incentive for getting other people involved in the game. They don't care if you actually have any interest; they just want those free coins or whatever. It's no coincidence, of course, that this is exactly the same sort of tactics that drug dealers use, manipulating addicts to their own advantage.

We say go cold turkey for a few days, maybe read a book or two, and try to forget the sweet, rewarding sound of gems exploding and score counters going up.

OMG! People would rather look at their phones than each other! Someone has to do something! Online petition, anyone?

Android Emulation

Did you know you can emulate your Android phone on your PC? You can, and here's how

Emulation is a fascinating thing and can be used to turn your PC into a vast array of different devices. Often skirting the grey area of legality, emulation has been used for all manner of things – from the very grey area of emulating past games systems, to running different operating systems, such as Apple's OS X within Windows. It's a very useful software trick, and one that opens up a great deal of functionality.

One area of emulation that's becoming very popular is that of mobile devices. Although most already have some form of mobile phone or tablet, it's often advantageous to be able to run mobile phone software on your home PC. This could be in order to share your information between your phone and your home office, or it could be to run mobile apps that won't run on your phone, such as apps that are too recent to run on older models of phone, or just run too slowly.

Android phones are the most popular around next to Apple's iPhone, and there's no shortage of them. There's also no shortage of Android apps, which can be found on the Google Play store. These run the gamut of usefulness, from productivity software to games and gadgets. There's a massive amount on offer, an with emulation you can run it all on your home PC, even if you don't own an Android phone. Thanks to Android's Google heritage, it's even easier in terms of user accounts, as you'll likely already have a Google account, and this is also used for Android. If not, you can create one for free.

What Is Emulation?

For the uninitiated who may not be aware of emulation, it's a method of using software to recreate another platform, often hardware-based. This includes, but is not limited to, old games consoles like the NES, Mega Drive and PlayStation, as well as other computers like the Commodore Amiga and 64, Spectrum and Atari ST.

This is made possible by software that's written to emulate the hardware of the target system within a software environment. When the program is run on a PC, the emulation can be used to run software designed for the emulated platform. This software can take the form of special ROMs – software versions of hardware cartridges or disks that used to be used (which is where the legality issue comes in) – original software, or downloads from the Internet. When it comes to Android emulation, the software emulates the actual OS, so it can contact and download apps directly from the Google Play store. This makes it easy to run your favourite apps on your PC.

So, simply put, emulation is software masquerading as hardware, which in turn runs software. This is a very complex task and one that can tax any system, regardless of its specification. Even emulators that reproduce older systems, such as 8-bit computers require a surprising amount of system resources and can make the CPU work very hard. Because of this, emulation usually requires fairly decent to powerful specification, with emulators that mimic more up to date platforms needing the most power. This includes Android, and to run some of the software we'll be covering here, you'll need to ensure your PC is up to the task. Even if it is, don't expect perfect performance. Even the best emulators can struggle maintaining full speeds.

Emulators

There are a number of emulators available for PC users wishing to run Android apps on their system. Some of these are free, while others ask a small fee. All are different, and as with any software, not all are equal. Let's have a look as some of the most popular.

AMIDuOS (www.amiduos.com)
$15 (Lollipop), $10 (Jellybean), free trial available
Considered the best overall Android emulator by many, AMIDuOS is a commercial Android emulator that comes in different flavours depending on the version of Android you want to emulate. The latest version of the app, which can run Lollipop, is the most expensive, but not by much, and if you're going to shell out for an

Emulators like AMIDuOS can run the latest games, such as the popular Bethesda title, Fallout Shelter

Using AMIDuOS

It's not at all difficult to emulate Android on your PC. Some emulators are easier to use than others, but there are rarely any real worries to be had. Here's how to get up and running using AMIDuOS.

Assuming you've already downloaded and installed AMIDuOS, before you run it, it's wise to fire up the configuration. Here you can change a few options that can be of use. One of the most important is the amount of system RAM the emulator can use. The more you share, the faster the emulator will run. You can also pick system options, such as enabling the emulator's root mode, which can be very useful (see Rooting it out). For Network, it's usually best to leave it on Simulated. Other options here involve the input mapping, camera integration, and GPS.

Once you're happy with the settings, all you need to do is fire up the program and it'll create the virtual machine.

You'll find yourself at the device lock screen, just as if you were using a phone or tablet. Swipe it up and you'll find your home screen. From here on it works just like a phone. Simply click and drag to swipe, and click apps or the icons at the bottom to use the typical Android features.

Once you've installed the Google Play code, you'll also be able to use the Google Play store, and can download and install anything you like, including games. There will be updated and handled just as they would on a normal Android device. If you want to change your wallpaper, click and hold and select the Wallpaper option. Easy.

Android emulator as you need to use it a lot, you may as well ensure you have the latest version.

The emulator makes full use a PC's capabilities which, naturally, dwarf those of most mobile phones. It can emulate the the ARM processor, but can run applications natively using the PC's x86 processor. This means it's a fast and reliable option, and it manages some of the best speeds of any Android emulator. It supports Windows 7 and up and will run on touch devices too, such as Windows tablets.

The emulator is powerful, and we found it was able to run pretty much anything we threw at it, including infamously resource-heavy apps like Google Maps. It was also able to handle Google's advanced services and even used the PC's mic to enable voice searching.

The desktop mode of AMIDuOS runs in full screen mode and offers full keyboard and mouse support to the emulator, making it very easy to use – and you can change the screen orientation with the click of a single icon. Internet connectivity, as to be expected with emulation, was a little shaky at times, but it was able to use both Ethernet and Wi-Fi, and the speeds were decent.

Sadly, the app doesn't ship with Google Play installed, instead it uses the Amazon store, which charges for apps that would be free via Play. You can download and install this, however (look for gapps emulation using Google), so with a little tinkering, you can get the full experience.

Andy (www.andyroid.net)
Free

Andy certainly appears to be the most promising Android emulator on paper, with being free the most obvious benefit. Once installed, it offers a range of great features, including full emulation of Android, (with full screen mode) and all the usual apps and tools you'd find on a typical Android device, including Google Play as standard.

Its more advanced features are what makes Andy stand out, however. It supports app sync to mobile, access to your local PC's file system, full cloud save support, system backup, and you can even use your phone as a controller. Hardware support is fully-fledged, and like AMIDuOS it makes use of x86 architecture. Touchscreens, cameras and microphones are integrated via the PC, and OpenGL is fully supported. You can even use Xbox or PlayStation controllers with the emulator.

Andy is a great emulator, although it is very resource hungry

Sadly, as great as Andy's feature set is, it's performance isn't up to the same standard as AMIDuOS. We found the emulator to be very sluggish, and it used up a great deal of system resources, more so than many other emulators. There was even a good deal of unresponsiveness and lock ups – and that was on a PC that far exceeds the recommended specs of Dual core CPU and 3GB RAM. We've also seen many user reports of suspected adware. Although we can't confirm this, as we had no problems, it may be something to look into.

Although it's not as fast or stable as others, Andy is still an impressive emulator that's packed with features, and it embraces not only the Android emulation, but the PC it's running on with some useful cross-platform capabilities.

BlueStacks (www.bluestacks.com)
$2 per month (premium), Free (forced app installs)
BlueStacks in an interesting one. Unlike AMIDuOS or Andy, which emulate the entire OS in a virtual machine, BlueStacks instead has a custom interface that allows selection of apps or games to be run on PC. This will turn off the most technical Android users who want the entire OS, but for those who simply want to run apps, this is a good thing.

Although BlueStacks can run the majority of Google Apps, the emulator is heavily focused on gaming, and so naturally the program pushes games to the forefront. This is perfect for people who do a lot of Android gaming and what that facility on their PC, and thus a bigger screen, or if their mobile device doesn't support the latest games.

BlueStacks is a game-focused emulator with a custom GUI

Performance of BlueStacks is quite good, and it runs at a decent speed without breaking your system's resource bank. This is presumably as it doesn't emulate the entire OS, so needs less power. However, there are major downsides, with the big one being the subscription cost and how the app deals with it.

BlueStacks is technically free, and you can use it without spending a penny. However, if you do this, you'll be forced to install sponsored apps of the day in order to continue using the emulator. To prevent this, you have to take up a subscription to the program, which costs $2 per month.

Now, this isn't much, and there's really not much to complain about if you game on Android all the time, but with other free options available, any charge may put some people off. If you play so much, you may not mind trying out new apps each day, though, so you may or may not find this to be a problem, so you can avoid the charges.

Other problems were minor. Occasionally the GUI can be very twitchy, and we noticed a couple of crashes during some, more intensive games. On the whole, however, this is a solid emulator and perhaps the best option for Android gamers.

Genymotion (www.genymotion.com)
Free (personal use), Variable for development/enterprise
This is an emulator to watch, as it boasts strong performance, on par with AMIDuOS. It's also free for personal use, which is always a plus.

The emulator is actually more geared towards developers and professionals, such as technical support, so it's not quite as user friendly as other options. It also requires more knowledge to set up and lacks support for Google Play without user workarounds.

Aside from these problems, Genymotion is an impressive emulator, and it's fast, using the x86 architecture of the PC.

Able to emulate specific devices, Genymotion is a unique emulator

Rooting It Out

Android owners may be aware of the ability to 'root' a device. This is similar to 'jailbreaking' an Apple device, and involves hacking it so it can run unofficial content, such as apps or even altered versions of the core OS. Many users choose to do this, even though it voids any warranty, which can lead to problems, including a bricked phone that no longer works. It's a gamble, but for many, one that pays off as it allows the use of all sorts of programs and tools the vanilla, out of the box OS doesn't permit.

If you'd like to try this, but you don't want to risk that expensive phone or tablet, emulation on PC is a good alternative. Some emulators feature the ability to run in a rooted mode, and this allows you to use the unofficial content on your PC, without the worry of breaking your precious mobile device. If anything goes wrong, it's just a virtual machine, and can easily be replaced.

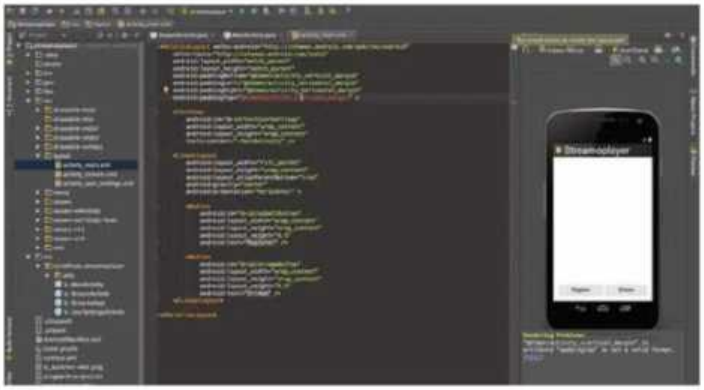
➤ YouWave is a smaller emulator, but one that's still very good

It doesn't simply emulate Android on PC, but can be set to actually emulate specific devices, such as Google's Nexus. This is very useful for app developers testing new software, but could also be useful in the home if you want to emulate your own device perfectly. It can also be used to create multiple virtual machines, so you're not limited to one at a time.

YouWave (youwave.com)
$30 (premium), Free (w/ ads, limited to Ice Cream Sandwich)
Now supporting Lollipop, YouWave is a small and fast emulator that features a mixture of Android OS and Windows GUIs to make a very easy to use tool. The app recreates an Android device in one window and stores all of your apps in a separate control panel for easy access. Windows buttons are always present for navigation, and the device screen can be rotated easily. The program can run most Android apps, and you can download them from the Amazon appstore (not Google Play, sadly). It supports Windows XP and up, and you can use SD cards with it for added storage.

As an emulator, YouWave is decent enough, and it emulates Android and runs apps well. The interface is clean and very easy to use, and in terms of resource usage it's very good. However, the limitation of Ice Cream Sandwich for the free version, with Lollipop only being available in the premium version is a problem, and the cost is quite high, especially given the lower $10 cost for AMIDuOS, which has more features and is more powerful.

Android Studio SDK (developer.android.com)
Free
The Android Software Development Kit is not one for the layman, that's clear from the very start, but it's a set of tools comes with an emulator so it is a viable option and we wanted to include it here. However, as it's a software development tool designed for Android app developers, this isn't an option for most home users. If you're an aspiring programmer who wants to get a start developing their own software, though, you could do worse.



➤ For developers, the Android SDK is a great tool, but emulation is slow and resource heavy

iOS?

Although it may be more difficult to emulate, Apple's iOS can also be run on a PC with the right emulator. Reliable ones can be harder to find than Android, but they do exist. One example is iPadan (**www.xpadian.com**). This is a free emulator that is able to fully emulate iOS within Windows.

The free version of the app is ad-supported, and features some limitations, but for the most part, it's perfectly usable. A paid for version includes more features, such as full 3D game support, no ads, and support for Whatsapp, Snapchat and more. It costs $10, which may be a good deal if you use a lot of iOS software.

Once installed the app is just like the the Android emulators we've covered, in that it features a fully emulated version of iOS, and runs and feels just like the Apple system. If you've used any Apple mobile devices, you'll be at home here.

➤ Apple's mobile devices can run virtually on your PC thanks to iPadian

➤ Access the App Store to grab your favourite software

The actual emulation is pretty bad to be honest and is possibly the slowest and most resource hungry of all the options we've covered. It's simply not optimised, and this limits its use to those wanting to easily test their code. To run actual programs as an end user, this just isn't a good option.

Being a development platform, it has the benefit of supporting all versions of Android, including the most recent, Marshmallow (6.0), and it's fully cross-platform, supporting Windows, Linux and Mac OS X. Support for the very latest OS will make this appealing to technophiles, and this alone may prompt interest for those who want to stay up to date and in touch with new Android developments.

That covers our look at some of the different Android emulators, and with any of these, you can get Android up and running on your PC. Whether you want to play games, use Android apps, or want to get buried in development code, it's there for the taking. Have fun! **mm**

Adventures In Text

Part Three:

Managing Software With The CLI

Leo Maxwell concludes this short introduction to the Linux command line with a look at software management

No doubt the Linux users among you will be asking "Where is (insert essential command here)?" Unfortunately, space limitations mean that there's much, much more to the CLI than I could show you in these three articles. This series was intended to whet your appetite, to interest you in finding out more, and to give you an insight into some things that are less often mentioned. I'll finish with an overview of something we all use but often take for granted.

There are several ways of adding software to your Linux installation. You can, if you wish, build software from source code or download it from a website, but the easiest way is install it from a safe repository using a package management system, of which there are several.

Going To The Store

Repositories, a little like app stores, are collections of software compiled and pre-packaged for your system. All the software in a distro's repository is validated against the original source code and tested for compatibility against other software in the same repository. Updates are supplied from the same source, hopefully ensuring that all relevant packages are upgraded together.

Managing software without a GUI is not as hard as you might expect.

There are various package management tools, depending on your choice of distro, but by far the most popular is apt.

APT

Apt is an abbreviation for 'advanced package toolkit'. It is the tool of choice for most Debian-based distros and is based on dpkg, the Debian package manager. It uses .deb files, which are pre-compiled installation packages for applications. These consist of two compressed files, one with the software payload and one with the control structure for its installation. This sets the default configuration and tells the package manager which programs and libraries are needed for the application to function, including which versions are required. These are called dependencies. If any dependencies are not met, the package manager will attempt

> **"Managing software without a GUI is not as hard as you might expect"**

to install the requisite packages to meet them as well. This can sometimes lead to the installation of several additional programs and libraries, and their dependencies as well.

The .deb files are downloaded to the package cache and then used to install the required programs in the correct order.

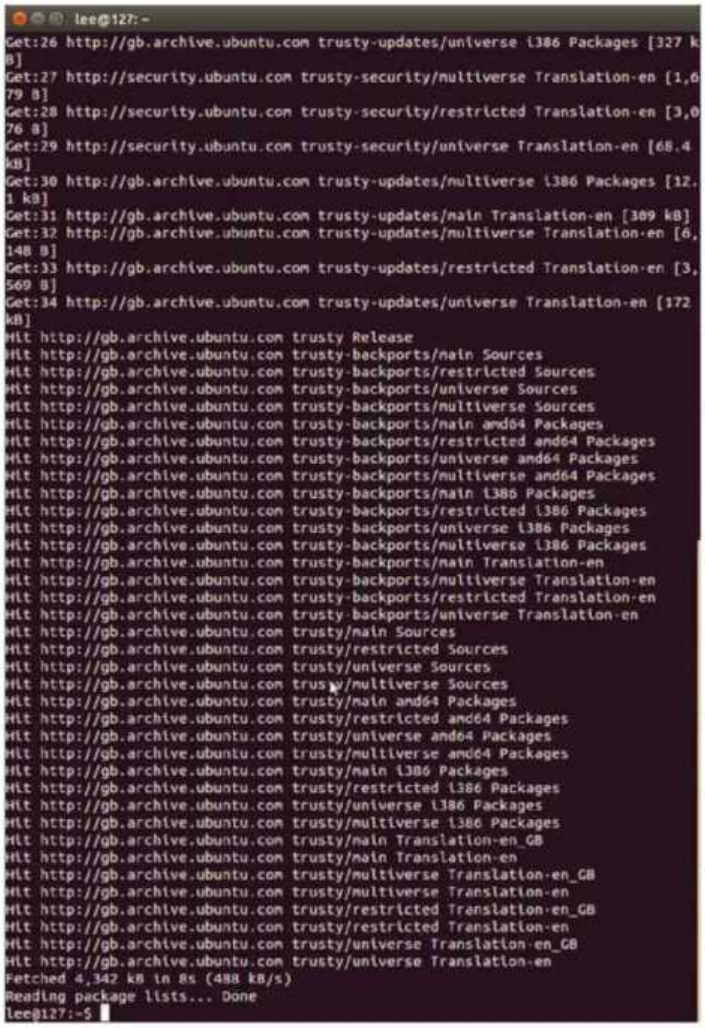
Apt is available for many Debian-based distros, such as Mint or Ubuntu.

Apt keeps a database enumerating all of the currently installed packages and their dependencies. It also maintains data regarding the contents of various repositories. The main list of repositories on your PC is the /etc/apt/sources.list.

Once a repository list is added and synchronised, it can be used for installation and upgrades. All distros publish repositories, and you can add others to the ones supplied if there's a particular package that isn't included in the standard ones. It's always best to use the correct repositories for your distro version, as they'll almost certainly include packages required to satisfy dependencies. For example, Ubuntu 14.04 will have a different set of repositories to Ubuntu 15.04. Installing packages for the wrong version may cause problems if a required library version is not available.

Some distros, such as Mint, also use Ubuntu or Debian repositories. Most distros will offer some sort of GUI for package management, but we are interested in the CLI.

apt-get is a CLI-based package management tool for apt, and its package handling is quite sophisticated. It will list all required files, flagging up any conflicts between different packages and attempting to reconcile them. If there's an unresolved conflict, it will not carry out installation.



A typical apt-get update screen

Before installing any software, it's a good idea to run the following command, prefixing it with sudo if required: ***apt-get update***. This will synchronise the local package lists with those from your chosen repositories, and it should always be run before installing any software.

apt-get upgrade will download and install any updates for your existing installed software. It will not install new packages, nor will it delete any packages.

apt-get dist-upgrade is more sophisticated, and will add new or remove old packages to meet dependencies. (Note that it will not update your distro to the latest version.)

apt-get search <keyword> will search the database for packages containing a text string.

apt-get install <package> will download and install a particular application along with any required dependencies.

apt-get remove <package> will remove an installed package and any packages that depend on it, but not configuration files.

apt-get purge <package> will remove a package and any global configuration files, although configuration files in a user's home directory are not usually affected and may need to be manually deleted.

apt-get ***autoremove*** will remove any packages that were installed as dependencies but are no longer required.

apt-get check will check the apt database for broken dependencies.

apt-get -f install will attempt to fix broken dependencies.

Housekeeping

Over time, quite a lot of package files may be stored in the cache when software is installed; and if software is removed, it may leave dependencies behind. The following commands may free up a fair amount of space in your system.

apt-get autoremove will remove packages that were installed by other packages but are no longer required.

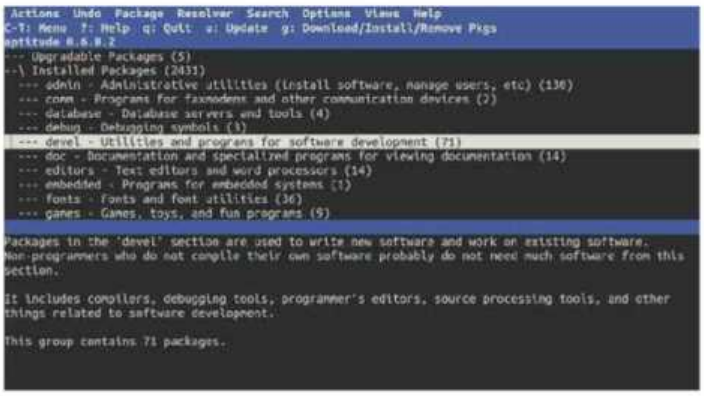
apt-get autoclean removes cached package files for programs that are no longer on your system.

apt-get clean removes all cached package files, even for installed software. This is not usually a problem unless you need to download again to reinstall.

Aptitude

Aptitude is a similar package manager to apt, but in addition to command line usage, it has a visual interface based on the curses library.

To install it, type '***sudo apt-get install aptitude***'. Once installed, it can be run by typing ***sudo aptitude***.



The aptitude visual interface for managing software

Adding Repositories

There may come a time when you need an application that is not available in your chosen distro's standard repositories. Of course, this involves a certain amount of risk, so you should make sure that a source is trustworthy.

You can add repositories that did not come as standard with your installation. Ubuntu, for example has PPAs, which stands for 'personal package archives'. These are developers' personal repositories, which they make available alongside the main repositories. They are usually more cutting edge than the mainstream repositories. Software from these repositories is not directly supported by Ubuntu, but by individuals or groups of developers.

Software Types

To manage compiling from source, you really need an understanding of what source code is and how it relates to the end product. Software consists of four main forms: machine code, assembled, compiled and interpreted.

The lowest level language is machine code. This consists of direct instructions to the processor and other parts of the physical machine. It is specific to the processor and architecture involved and is not really human readable, being written in binary ones and zeros.

Next up is assembly language. Although this is human readable, it's closely linked to the machine code and is usually specific to a particular processor architecture. Assembly source code is converted into executable machine code by a utility program referred to as an assembler.

More human friendly and more portable are compiled languages, such as C, C++, COBOL, or FORTRAN. These consist of text source files, which are converted into machine code using a program called a compiler. Although the compiler may be machine specific, the source files are more portable.

Last are the highest-level languages, such as BASIC, Perl, Python or even bash. These are known as interpreted languages and consist of text files, which are converted at run time into machine code by a program called an interpreter.

It's fairly obvious that the further you get from the machine code, the easier it gets to understand, but there's a higher overhead involved in actually executing the program. This leads to slower operation, as the program requires more processor time to run.

There are many variations and hybrids of these four forms, but arguably the most efficient development systems involve compiled languages. These strike a happy medium between readability and efficiency.

C and C++ are among the most widely used compiled languages, and the details on compiling in this article refer to those.

Some companies, such as Nvidia, make repositories available for their proprietary driver software.

You can either edit the /etc/apt/sources.list file or use ***sudo add-apt-repository <repository name>***. Then run ***sudo apt-get update*** to synchronise the source list.

You'll then have access to the contents of that repository.

As an example, to install Webmin, a useful web-based system management tool, first make a backup copy of the sources list:

sudo cp /etc/apt/sources.list /etc/apt/sources.list.old.

Then edit it:

sudo nano /etc/apt/sources.list

Add these two lines to the bottom of the file:

deb http://download.webmin.com/download/repository sarge contrib

deb http://webmin.mirror.somersettechsolutions.co.uk/repository sarge contrib

Hit Ctrl-O to save, and Ctrl-X to exit, then download and install the gpg key, which is used to confirm the origin of the file. Now enter the following:

sudo wget http://www.webmin.com/jcameron-key.asc
sudo apt-key add jcameron-key.asc

And finally:

sudo apt-get update
sudo apt-get install webmin

You can then connect to the Webmin application using ***http://<ipaddressofcomputer>:10000*** (e.g. http://192.168.0.12:10000).

The webmin remote system management interface

Downloading From A Website

The most common mistake that new Linux users make is that they assume they need to find software on the web.

Unlike Windows, most software is available from your distro's built-in repositories. Unless there's a missing application that you really must have or a hardware driver that you cannot install from your distro's repositories, downloading software from a random website is a bad idea. If you download and install a program, you need to make sure that it's from a reputable source and that it is compatible with your system. It is important to note that programs you install this way won't be automatically updated by your distro's update manager, even if they contain security vulnerabilities.

Besides the obvious security risks of installing from an unofficial source, you may find that it has unmet dependencies, which will have to be installed first. This can lead to a lot of searching to find and install all the other files required.

The exception to the rule is software provided by hardware manufacturers for use with their products, which may not be available from any other source due to copyright issues.

From the command line, downloading is usually handled by wget. The wget command can download from websites using both FTP and HTTP, and it's very flexible, able to download files, folders and even complete websites.

If you find a file you need, then you will need the complete URL for the file.

Examples:

wget http://www.somehost.org/files/tester.tar.gz

wget ftp://ftp.somehost.org/files/tester.deb

“There may come a time when you need an application that is not available in your chosen distro's standard repositories”

Such software may come as a .deb or .rpm package, or as source package with a shell script, which needs to be made executable and run to install the software. We'll deal with .deb files first.

You'll find that apt-get will only work with repositories using ftp or http. To install from a local package file, we'll need to install another tool, called gdebi. So we type ***sudo apt-get install gdebi***.

Once installed, gdebi can be used to install a package from a local file, and it will also use apt-get to install any required dependencies if they're available in your existing list of repositories. The command format is ***sudo gdebi <path to filename>*** (e.g. sudo gdebi /home/leo/Downloads/somepackage.deb).

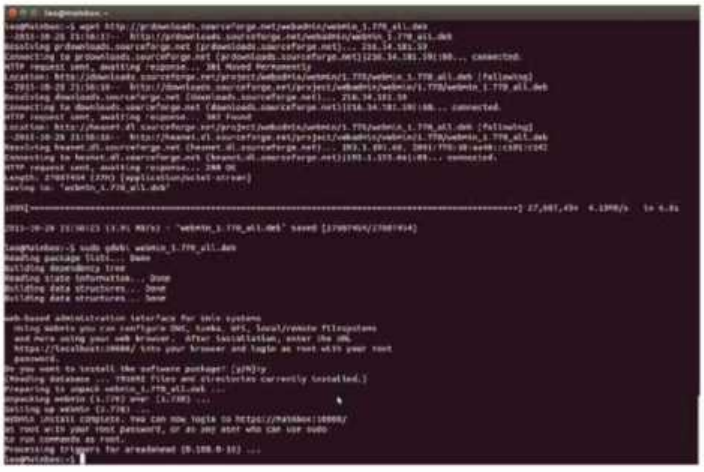
This may fail if there are unmet dependencies, but if there are no errors, it will install the package in a similar way to apt.

As an example, to download and install the previously mentioned Webmin application using wget and gdebi, type:

wget http://prdownloads.sourceforge.net/webadmin/webmin_1.770_all.deb

Followed by:

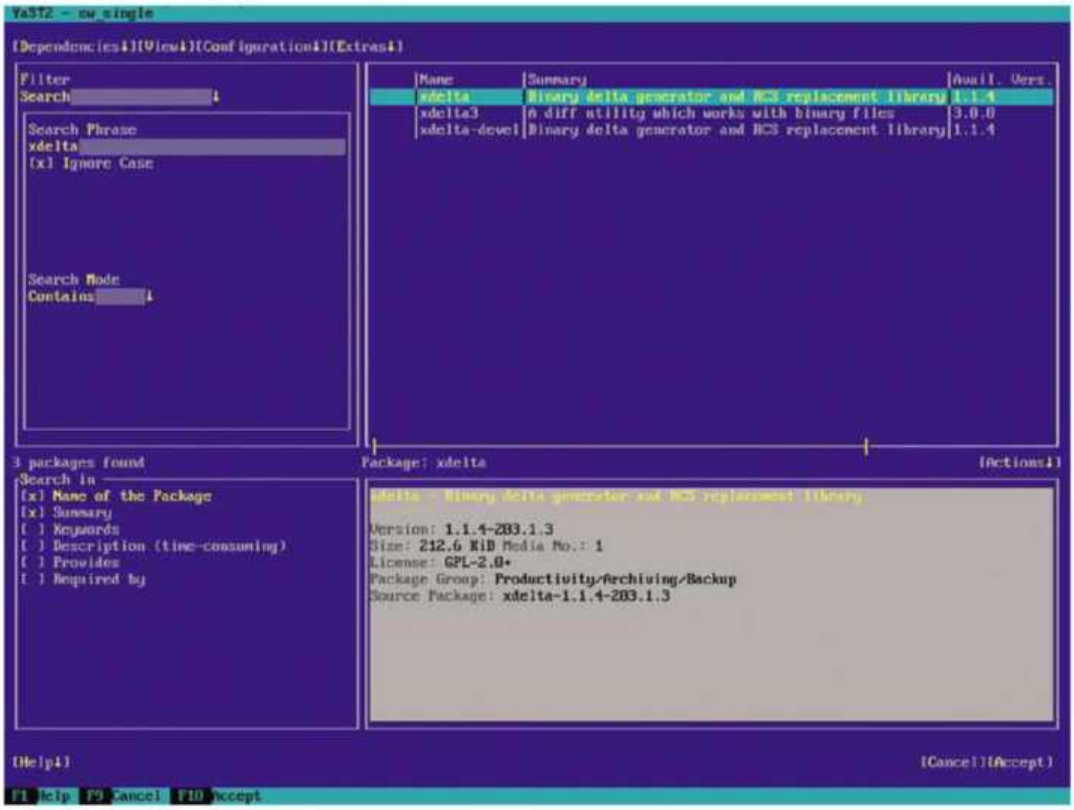
sudo gdebi webmin_1770_all.deb



Using wget to download a file and gdebi to install it

Compiling From Source

Finally, we come to the most complex type of software installation. Although many programs come as pre-compiled code, there are various reasons for compiling from source. You may have hardware whose manufacturer only supplies source code drivers as 'binary blobs'. These are pre-compiled chunks of code, around which you still need to build the rest of the modules for the kernel.



➤ Suse's YAST setup tool showing the software management section

Sometimes you'll find an obscure application or a new version of a program that is unavailable as a pre-compiled package, or you may want to use features that are not enabled by default, and some distros, such as Gentoo only use source packages. Programs you install this way won't be automatically updated by your distro's update manager, and drivers may need to be recompiled every time you update your kernel.

Preparation

Compiling from source for the first time is a little daunting but not particularly difficult. You don't have to be a programmer to build a program from source and install it on your system; you only have to know the basics. There are many more involved procedures that are not mentioned here.

Before you can compile source code into machine code, you need some tools. Luckily, installing them on Linux is not difficult.

Compiler

Of course, to compile code, you need to install a compiler. There are other C++ compilers, but GCC and G++ are the most widely used.

Kernel Source And Headers

If you're building a complete kernel, then you need the complete source files. However, if you're compiling a device driver or other loadable module that links into the kernel, then you only need the header files, so you can save space by not installing the full sources.

Headers are files that define interfaces to functions as well as structures used by programs, and they're used to avoid having to download and store the complete source code.

In the case of the kernel header files, the functions and structures are within the kernel itself. This separation of packages to allow just the header files to be installed harks back to when disks were much smaller and space was at a premium. These days, having the entire source for a kernel or even several kernels on disk would probably not be a major problem.

In Ubuntu, there's a package called build-essential, which will install most of the required tools. These include the g++ and gcc compilers, the make utility, the dpgk-dev development tools and libc6-dev, the embedded GNU C library. To install this, type ***sudo apt-get install build-essential***.

You will also need the Linux headers, and these can be installed using the following command:

sudo apt-get install linux-headers-generic linux-headers-$(uname -r)

The first package comprises the generic headers; the second includes the specific headers for your currently running kernel.

Once these are in place, and having downloaded the source code that you wish to compile, you're ready to start.

Usually, source packages come as an archive, commonly in .tar format. The name tar is an abbreviation of tape archive, and comes from a time when backups were routinely stored on tape. The tar command has many options and is widely used in the Unix community for archiving. Used on its own, it creates an uncompressed archive (one file containing multiple files). This can be compressed using various methods. The most commonly used are gzip (.gz) or bzip2 (bz2). Before you can use an archive, you'll need to extract it.

Use this command to extract a .tar.gz file: ***tar xzvf filename.tar.gz***.

Use this command to extract a .tar.bz2 file: ***tar xjvf filename.tar.bz2***.

You'll end up with a directory with the same name as your source code package. Once extracted, the folder will usually contain a readme or install file, which will explain what is required to install the package. Depending on the package, you may need to run two or more scripts. To do this, cd into the new directory.

Oranges Are Not The Only Fruit

Of course, in the world of Linux, as with anything, there are many alternative methods for managing software. Although there are several other distro-specific formats, the most widespread alternative to .deb is the .rpm format.

The RPM Package Manager uses .rpm files which, like .deb files, are pre-compiled installation packages for programs. They are, however, structured very differently, and there are various types. Although there are some tools to convert between the two formats, notably Alien, they are variable in their success.

RPM was originally the RedHat Package Manager and is used by RedHat-based distros, such as CentOS and Fedora, as well as others. OpenSuse and Mageia, for example (although they diverged from RedHat long ago), also use this package format, although they may not be compatible with RedHat .rpms. Again, it's best to use the correct repositories for your distro version.

The RPM command is a little less user friendly than apt. Installing a package:

rpm -ivh <package name>

Removing a package:

rpm -evv <package name>

Luckily, there are various more user friendly tools to manage rpm files for rpm-based distros.

RedHat uses yum, Mandriva uses urpmi, OpenSuse uses zypper, and so on. These are all attempts to emulate apt's ease of use, and they're all very different. Even apt has been ported to the rpm system, in the form of apt-rpm.

There are also CLI-based graphical tools – for example, Suse's YAST setup tool, which includes a section for managing rpms.

Yum is perhaps the most similar to apt, and it's possible to use it with most rpm-based distros, although it may not be installed by default.

Yum Commands

yum install <application> installs the application, along with any dependencies.
yum remove <application> surprisingly enough, removes a package and all of its dependencies.
yum autoremove removes packages that were installed as dependencies, but are no longer required.
yum list updates lists all available updates.
yum update <application> updates the application. It can also be used with DOS-type wild cards. For example, ***yum update at**** will update any available packages beginning with 'at'. Used alone, yum update just updates all available packages.
yum clean all clears all caches.

Configuration

If it is there, the configure script will check your system to make sure that all the required libraries etc. are available and at the correct version. To run the configure script, type ***./configure***.

If a required dependency is unmet, the script will display an error message to tell you what is missing, and you'll need to install or update that library or application before continuing.

> **"To manage compiling from source, you really need an understanding of what source code is and how it relates to the end product"**

(Not all packages need a configure script. Some may require you to run a differently named script or to add flags to the script according to your requirements.)

Once the configure script runs without errors, you can start building the application from the source code. To do so, type ***make***.

The make command will read the make script and use the accompanying source code to create the application. There will be a lot of scrolling text on the screen, and this process can take some time, depending on the size and number of modules being created.

When it finishes, the command prompt will reappear.

Assuming that the build completed without errors, the next step is ***sudo make install***.

The make install command copies the created files into the correct locations in the filesystem, sets up links etc., loads modules and generally completes the installation.

Don't delete the program's source directory, in case you want to remove it later. You can run the following command from within this directory to remove the program from your system:

sudo make uninstall

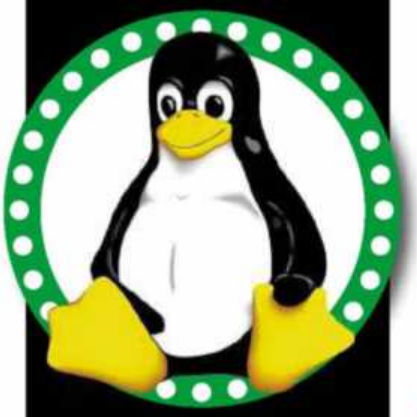
Once your new software is installed, you'll need to launch it by typing the command or starting it as a daemon. If the latter, instructions will usually be there in a readme. A restart is only necessary when the kernel itself has been updated, although you may find it simplest to do a reboot.

And Finally...

This is where we end this short introduction to the Linux command line. The command line is nothing to fear, and the more that you use it, the more your confidence will grow. I hope I've been able to clear up some common misconceptions and interest you in learning more of its workings.

As usual, I will be posting code snippets from this series on the Micro Mart forum in the magazine section.

Whatever happens, enjoy it! **mm**



PlayStation Linux

A hacked PS4 running Linux

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Ever since Sony pulled the Other OS support from the PlayStation3 some time ago, there's been a select group of hackers who have fought to slice through the console's various protective layers to see if they can install some flavour of Linux onto the system.

Fail0verflow, the hacking team behind the newest Linux installation on the PS4 revealed recently its proof that the PS4 isn't a digital Fort Knox and can in fact be 'modified'. The group demonstrated the hack in a session at the 32nd Chaos Communication Congress a few weeks ago. According to the write-up following the demonstration, the group used an exploit found in the PS4's operating system, FreeBSD and WebKit, which runs the console's internet browser.

However, to successfully get to the vulnerability, the team had to use a PS4 that was several versions lower than the current system update – as the vulnerability has since been fixed. But essentially the team did get the console to boot a version of Linux and access some of the system's hardware and resources.

Available Resources

Before you go and cleverly convert your PS4 OS to Linux, though, there are a few issues that need to be considered.

For one, the hack only manages to use 16MB of the system's video memory core. According to the most recent post I read, the actual 8GB of system memory isn't accessible at all. Furthermore, although there are some graphics resources available, the full AMD eight-core Jaguar APU isn't anywhere near being addressed, and you won't be able to access large chunks of the system OS or sections of the internal hard drive.

The Blu-ray drive is also out of bounds, as are most of the custom made motherboard resources. This means that although the exploits have indeed been tackled, there's still a long way to go before you can install a fully working Linux PS4.

Why?

A lot of you may well question why even bother at all? I mean, it's not like installing Linux on a PC that came with Windows pre-installed. You don't get much out of a hacked PS4, other than a different front end, and there's the likely probability that you'll void any warranty by hacking it in the first place.

It's the pursuit of the hacking that drives these group, I guess. And fair play to them; I'd rather they focused their talents on something like this, rather than going off the rails and doing something more damaging.

So how long will it be until someone works out a fix to get access to the full PS4 system resources? No idea. And will it eventually be able to work as a Linux PC, with perhaps a copy of SteamOS installed too? Probably not.

The PS4 was never designed as a PC, even though the internal components are essentially mostly PC parts. And wouldn't running an unoptimised system be a waste of all that money you spent on it?

We'll just have to wait and see what 2016 has to offer.

The PS4 has been hacked, and now it runs a version of Linux

Linux

News Bytes

Sven Harvey reports on some of the recent developments

You can now pre-order brand new Amiga 1200 moulds, in various colours, separate to the Kickstarter campaign they launched from. These match and improve on the original, first used by Commodore and then Amiga Technologies for the various versions of the Amiga 1200 classic computer.

AmigaStore.eu, which got involved with the Kickstarter early on, is offering the replacement cases, featuring various improvements such as ventilation strips on the trapdoor and signatures from Amiga royalty in the form of RJ Mical, Dale Luck, Dave Needle, Ron Nicholson, Dave Haynie and Commodore UK's David John Pleasance.

These anti-UV ASA plastic cases are available in various colours, including the original off-white. They'll accept all forms of the original A1200 motherboard or, instead, some Raspberry Pi boards and the MiST board, as well as certain A1200 enhancements and adaptors.

You can find the cases for pre-order at **goo.gl/73vaeT**.

Free Game!

Tales Of Gorluth, released originally in 2014 by AmiWorx, has been made available by the author as a free download. This seems to be acting rather nicely as a demo to encourage people to pre-order the sequel, which is due to be released in June.

This top-down adventure game features more than five hours of gameplay, spread over three main quests, all enhanced by 41 pieces of music.

Check out a video of the second game and pre-order from **www.talesofgorluth.de**, where you can also find the download link for the first game in the series.

New Game!

R3D Project is prepping a final version of a new game by the name of *Tanks Furry* (I assume it actually meant it to be *Tank's Fury* considering none of the tanks I have seen are dressed up as foxes or anything).

Due for release next month, the game will run on any classic Amiga with a 68020 processor or better and at least 1MB of ChipRAM (so a base A1200 will be fine for instance). And though a boxed version on a CD-ROM with some extras will be available, the stand-alone download will be offered for free.

Check out the trailer at **youtu.be/GIMKJ3fxJ8w**.

A Return

Infinite Frontiers is returning to the web with a redeveloped website, which is due to host various retro game downloads, as well as its own Amiga productions from back in the day.

Infinite Frontiers released the Holodeck slideshows, the CD World diskzine and, famously, the diskzine known as The Final Frontier on Amiga floppy disk. The later issues of The Final Frontier gained a great deal of critical acclaim in the Amiga magazine. Keep an eye on **www.infinitefrontiers.org.uk**!

Ch'illOut"

Tim 'CoLD StoRAGE' Wright is taking pre-orders on his new album, Ch'illOut". This follows on from his most recent Amiga-related albums: Strix Memoria (Psygnosis music) and, of course, the David Whittaker Vs Tim Wright remixes of the soundtrack from *Shadow Of The Beast* for the *Commodore Amiga: A Visual Compendium* Kickstarter.

Stretching to 14 tracks and two CDs, it features down-tempo chilled and ambient remixes of his music from *WipEout* and *WipEout 2097* (the Amiga PPC version of the game features all of Tim's original *2097* music as CD audio on the game CD-ROM). The artwork for the album is being provided by original *WipEout* artists too. You can pre-order the double album up until 31st January. And you even have a chance of winning one of the last remaining copies of the USB-based Strix Memoria albums, or even the CoLD SToRAGE hoodie as worn by Tim at the Amiga30 UK event!

Find out more at the website: **www.coldstorage.org.uk.**

Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Let's Dance

Ian McGurren looks at Google's Project Tango and other CES highlights

Last week, we looked at some of the innovative products for the home that have interaction with mobile devices, using them as a gateway for gathering of information about things such as your food, your health, and your house, all from their sensors and devices. But one of the more esoteric, yet innovative, products at CES learns about what surrounds it in a very different way. You may have heard of Project Tango before; it originally appeared as a tablet a short while ago from Google's Advanced Technology and Projects team. If you haven't, it's essentially a mobile device with a twist. And when you learn that the man leading Project Tango used to work on the Xbox Kinect, you might have an idea of what that twist is. To call it mobile meets Kinect is probably a fair, albeit simplistic way of explaining it, as the technology it adds to the mobile platform is much the same idea of the device 'feeling' its way round 3D space. While it's been available for a bit of you're a developer, Google has partnered with Lenovo for a consumer-focused phone version, which debuted at CES. To demonstrate what the Tango additions can offer, it showed what was augmented reality, but turned up to 11. So instead of just gyroscopes determining your place in space, the multiple cameras could lock you precisely to a position. It's technology like this that will allow, for instance, hyper-local navigation, especially where GPS cannot reach – inside a huge airport to find a gate, or maybe even finding (or even keeping an eye on) friends when nightclubbing, or kids in the shopping centres, for example. It doesn't have to be on a phone either, and Google gives a learning robot as an example. While it's still in the early stages, in the next five years this sort of technology could well become commonplace. Then the Roombas will take over...

It wasn't just houses talking to mobile either; cars are increasingly getting connected. Since the mobile explosion, car companies have had a fascination about combining the two, and it makes perfect sense, especially given the mobile and tablet have overtaken many of the car's traditional functions (such as mapping, sound and vision), leaving the vehicle's own computer systems looking very limited and dated. Little wonder, then, that Ford has teamed up with Amazon to bring the retail giant's Alexa digital assistant to Ford's vehicles in the future. While it may seem odd barking instructions or questions at your car, that – like talking to your phone – will pass, especially when it's far safer than fumbling with the radio.

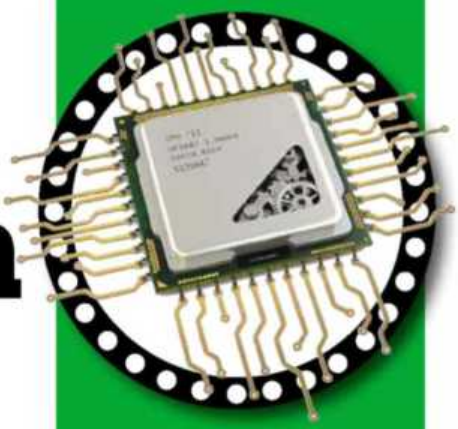
There are other areas that are making a play for the automobile industry too, including the likes of Imagination Technologies, with its PowerVR chips, more noted for being the GPUs inside many phones and tablets. Typically, a GPU can perform its duties on many different platforms, and not just pushing polygons either. It's expected that the chips here will also take on assisting roles, such as video recording of journeys, vehicle recognition for safety, parking calculation, even augmented reality overlays. Plus, of course, the more of these units sold, the cheaper they become and offer a keenly priced solution for budget devices. Win win.

With cars and mobiles being all the fashion, Microsoft isn't wanting to be left out either, with a mobile version of Windows 10 earmarked for vehicular use. What's especially interesting here is it wants to bring Office 365 to the car. Not surprisingly, you'll be unable to prepare Excel formulae on the road, but you will be able to deal with correspondence, appointments and even music. Given it plans to use Cortana, how much of this will be useful to you depends on how much you use Microsoft platforms in general. Nevertheless, this could certainly give a new twist to the term 'company car'...

Ian McGurren is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Cross The Streams Again



Andrew Unsworth takes another look at media streamers

Before Christmas, I mentioned that media streamers make good presents, as they're often inexpensive compared to other tech items, yet they're genuinely useful to someone who doesn't typically like technology. We had a look at the Now TV box and Roku range of media streamers, but this week we're casting our net further afield and looking at a couple of the other streamers available.

First up is the Apple TV, which is a petite black box with an even more petite remote control. The Apple TV lets you stream items you've purchased from Apple, such as films and music, to your TV from the internet. You can also stream items over your local network from a computer running iTunes. Should you be bored of the content you already own, you can access the iTunes Store to buy new TV shows, films and music.

I've had an Apple TV for a couple of years now but have never really used it. To be honest, I prefer the Roku, because I find the home screen is more customisable, and you can download apps, games and channels from within the Roku's interface. That doesn't mean the Apple TV is without merit, though, as that's simply my personal preference.

However, the Apple TV's strength comes not only from its ability to have media streamed to it from other devices and download content from iTunes and the App Store. It's also from the ability to play content from an iOS device, and even mirror the contents of your iPad or iPhone on a TV. The mirroring feature is especially good when playing multiplayer games such as virtual board games. Sadly, not all apps will allow you to play content through the Apple TV.

My version of the Apple TV, the third-generation model, is no longer the latest, but it is still available to buy for a more than reasonable £59. The latest version of Apple TV is the fourth-generation model, which is priced from £129 up to £169. The reason for the 'from' is the option of 32GB of internal storage or 64GB.

Apart from the built-in storage, the fourth-generation Apple TV has voice control via Siri, access to the App Store and an upgraded remote control, which has a touch-panel for easier navigation, microphones for speaking to Siri and the ability to sense movement. If you have one or more Apple devices, then the Apple TV is a good buy whichever version you choose.

Briefly, I just want to mention a media streamer that's only £30 and is small enough to carry anywhere: the Google Chromecast. Users plug the Chromecast into their TV and then connect to the device with a smartphone, tablet or even a regular computer. Users can then 'cast' media from their device to the Chromecast and see it on their TV. The media can be movies, photos or even web pages. For £30, it's worth buying one and keeping it at work or home, or in an overnight bag for when you go to a hotel.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Creed Is Good

While we'll have to see whether Assassin's Creed takes a year off or not, the Chronicles platform games are a great way to indulge your inner assassin

This week, Ryan checks out the rumours surrounding the Assassin's Creed franchise, and the forthcoming updates for Star Wars Battlefront and The Old Republic...

Plug & Play

Assassin's Creed may be Ubisoft's biggest franchise by some margin, but has the pressure of getting a new entry out every year – a schedule the publisher has held to for seven years now – begun to take its toll? The release of *Assassin's Creed Unity* in 2014 was overshadowed by technical glitches, not least the now-infamous bug that left characters bereft of skin. *Assassin's Creed Syndicate*, last year's franchise chapter, mercifully lacked those kinds of embarrassing problems, but reviews were cautiously positive rather than rapturous.

In recent weeks, rumours have begun to circulate that *Assassin's Creed* may take a year off for the first time since 2008, with the next major entry not due out until 2017. According to an anonymous poster on 4Chan (who claims to be a developer working for Ubisoft), that game will be called *Assassin's Creed Empire*, will take place in Ancient Egypt, and will form the first part of a trilogy set in antiquity – Greece and Rome are reportedly the chapters planned to come later.

It's further suggested that the team behind *Empire* is the same one that brought us *Black Flag* – the acclaimed 2013 entry that introduced exciting naval battles to the usual platforming-fighting mix. That team could, if the rumours are correct, change the formula up again; the story goes that Empire will borrow some ideas from *The Witcher*, with "player progression" and a "freeform combat system."

Could this be wishful thinking, or is it a genuine glimpse behind the scenes of *Assassin's Creed*'s next entry? While the franchise continues to be a sales success, even its most ardent fans would surely agree that it could do with an injection of fresh ideas.

Even if the main *Assassin's Creed* series does take a break in 2016, there are still the spin-off *Assassin's Creed Chronicles* games to tide us over. This trilogy of 2.5d platform games actually takes the series right back to its roots, when it was originally intended as a reboot of the *Prince Of Persia* property. Like the early *Prince Of Persia* games, *Chronicles* is a series of action platformers with plenty of combat and a smattering of stealth.

The first *Chronicles* game, *China*, came out last April, while the 19th century-set *India* emerged on 12th January. The third and final part, *Russia*, is due for release on 9th February and takes place in the turbulent early 20th century era of the Bolshevik Revolution. They're simple diversions when compared to the main *Assassin's Creed* games, for sure, but they're solidly built and are great for a few hours' stalk-and-slash fun.

As for *Assassin's Creed Empire*? If the rumours surrounding it are true – and sources cited by Kotaku suggest they are – then we'll almost certainly be hearing more about it very soon.

Online

As *Star Wars* sequel *The Force Awakens* sucks up millions of dollars at the global box-office like a Death Star tractor beam, EA's Lucas-verse shooter *Star Wars Battlefront* has enjoyed a similar clamour of interest. In recreating the sights and sounds of the movies, *Battlefront* has been a roaring success, but a lack of longevity has been a common criticism among players and reviewers

▲ *EA Dice has reassured players that more modes and improvements for Star Wars Battlefront are incoming, including a selection of new maps. Hurrah*

alike. And with *The Battle Of Jakku* DLC – which came out back in December 2015, close to the release of the game itself – being the only update to have appeared at the time of writing, the clamour for more modes and content has been gradually risen.

Thankfully, EA appears to have been listening; while firm details are currently sketchy, it seems that more DLC – and some improvements to *Battlefront*'s technical shortcomings – will be formally announced in the near future.

"I can only say that we're going to announce what the DLC is about soon," wrote Guillaume Mroz, one of *Battlefront*'s designers, in a forum post. "Offline multiplayer has technical difficulties that the single-player guys are definitely looking at. I can't give any dates for that, but we're very aware of the huge request for this."

"We will be adding more of what you love about the game," added EA Dice's vice president, "like new maps and Star Cards, for free in the coming months, in addition to all of the content we have coming with Season Pass. We'll have more to share soon."

Battlefront isn't the only *Star Wars* game getting an update either. *The Old Republic* may have been released at the wrong time to capitalise on the renewed interest in the *Star Wars* galaxy ushered in by *The Force Awakens*, but it's still going strong over four years after its original release. Sure, BioWare's MMO has suffered its ups and downs over that period, but its flexible business model, with the choice of free-to-play routes or subscriptions both open to players, seems to have helped it along considerably. The 11th February sees the release of the first chapter in a seven-part series of updates called *Knights Of The Fallen Empire*.

That debut chapter, called *Anarchy In Paradise*, introduces an "infamous mercenary" called Firebrand, whose "mission is to destroy the Eternal Empire by attacking Zakuul and crushing the seat of power, the Eternal Throne."

Lest we forget, *The Old Republic*'s massive budget (reckoned to be around $200m or so) means it's one of the most lavish MMORPGs out there, even now. With this new batch of content just around the corner, now could be a great time to give the game a try.

Incoming

Dear Esther was a unique and incredibly atmospheric first-person experience, so it's little surprise that we've been following its developer's next game with extreme interest. For a while, it looked worryingly like *Everybody's Gone To The Rapture*, a sci-fi story set in a quiet British village, might not appear on PC – indie dev The Chinese Room having made a lucrative deal to bring its game out on the PlayStation 4. But many months on from its console release, and it looks as though it really is coming to Steam after all; while there's no official confirmation yet, some rootling around in Steam's database reveals that some banner art and other telltale files suggest that it won't be too far away. If the signs are being read correctly, a truly unique interactive mystery could be heading our way soon.

▲ *If you were enthralled by Dear Esther, you'll be relieved to learn that the spiritual successor, Everybody's Gone To The Rapture, will be heading to PC too*

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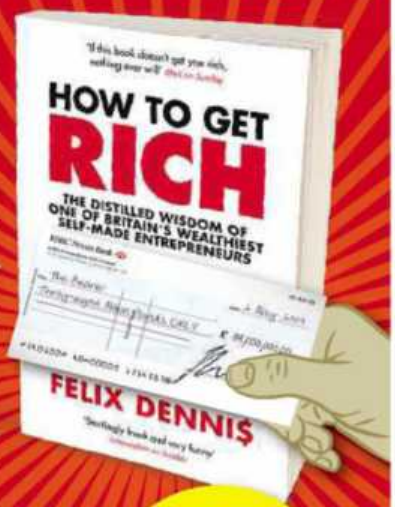

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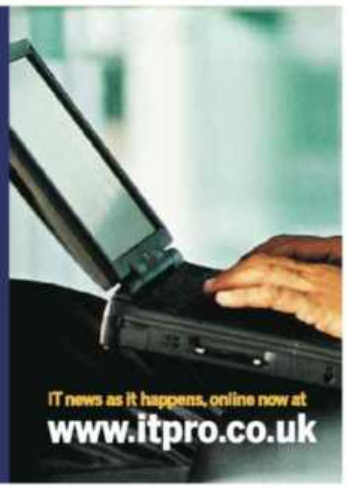

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Gigabyte Geforce GTX680. Model GV-N680D5-2GD-B, 2048MB RAM, PCIe x16, bare card, no box. £200 ono. Collection only from Wokingham RG41.
Tel: Bob Pratt (01189) 781753
Email: bob@docbobs.com

Motherboard Bundle 3.5+Ghz AMD 64 bit CPU 1gb Ram (max8gb) 2pci-e 4pci 2IDE 3SATA+ 1eSATA 8usb ports LAN sound Great for gaming, office work, surfing the net, watching movies generally a good all round system spec can slightly be changed. Please email or call for a price
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

PC Desktop Ram (DIMM) Memory. 64MB Siemens PC100-322-620 MT8LSDT864AG-10CZ5 - Only £8.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

2.1 speakers with sub woofer slight buzzing £25
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Motherboard Bundle. 2.4Ghz AMD Athlon XP 32bit CPU 512MB Ram 5xpci 2IDE LAN sound good for gaming, office work, surfing the net, watching movies generally a good all round system spec can slightly be changed if required please email or call me for a price
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Internal 3 1/4 floppy drives. Choice of white/black/silver/no face plate please email or call me for the prices
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

PC gaming hardware. I have got 1 x force feedback steering wheel 1 x force feedback joystick 1 x normal joystick lots of game pads please email or call me for a price
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Motherboard Bundle. 2.8Ghz Intel 32bit CPU 512MB Ram 3xpci 2xSATA 2IDE LAN sound good for gaming, office work, surfing the net, watching movies generally a good all round system spec can slightly be changed if required please email or call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad to MicroMartClassifiedAdverts@gmail.com and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: You bought a Corsair water cooler, with a square block. You fitted it to your Intel processor. You want to make a few pounds from the spare A.M.D. bits? Contact me!
Email: johnrpeel@gmail.com

WANTED: Gigabyte GA-Z77X-D3H motherboard wanted.
Email: johnbeiry@gmail.com

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: 3G dongle for Archos 80 G9 tablet.
Email: alancox28231@gmail.com

SOFTWARE FOR SALE

Sim City 2000: Boxed and original. Classic gaming. £15.00
Tel: Gordon (01314) 660205 Email: scobieg09@gmail.com

Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

PCB design software. 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net

Microsoft Office 2013. Original Software only £100.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Nuance Omnipage 18. OCR; Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Norton Family Premier 2.0. Runs under Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

SOFTWARE WANTED

Good Text to Speech program WinXP or 7 to read ebooks aloud for a pensioner with few resources.
Tel: Wilf James (01767) 699809

Wanted: PictureToExe software, for making picture shows.
Tel: (01202) 610602
Email: ivor.mary@talktalk.net

Wanted: Quicken 2001. I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program but have lost my original installation CD.
Email: david.maddams@icloud.com

Wanted: I have a BCL 2.4g Wireless Gaming Mouse, Model: RF0P77 (3v 7ma) but no Drivers. Can someone help with a copy of the Original Drivers for this Wireless Mouse?
Email: Cliff Evans
cliffordevans603@btinternet.com

IMPORTANT BUYING ADVICE

We work very hard to police our classified ads, and make them as secure as possible. However, please do your bit too and use the following guidelines:

• **Never - NEVER -** pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.

• Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk

• Keep copies of all correspondence

• When sending out goods, at the least obtain a certificate of posting from the Post Office

If you are in any doubt, feel free to send us a mail via editorial@micromart.co.uk.

Every year, thousands of successful transactions take place through our classifieds, and that's just how we like it.

Help us help you keep them one of the safest and most secure places to buy and sell computer kit.

ASK AARON

Meet Aaron Birch. He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty and you're very much welcome to it!

Send your questions to:
Aaron Birch
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Win10 0x803F7001

I just built a new PC and decided to install a clean Windows 10 using my Windows 7 upgrade key. I downloaded my Windows 10 from **www.microsoft.com/en-gb/software-download/windows10**, then I burned it to a disc.

The install went perfectly, and my Windows 7 update key worked and I was a happy bunny as Win10 was and is working fine. Then I started getting messages regarding activation, and when I tried to sort this out by following the instructions, it resulted in a phone call to an Indian call centre.

This started with a request to input on my phone various numbers, after which I was transferred to a very unhelpful Microsoft agent who mumbled something about the November update and hung up!

For reference, this is what I see [below]. Can you advise what is going on and how I might correct it?

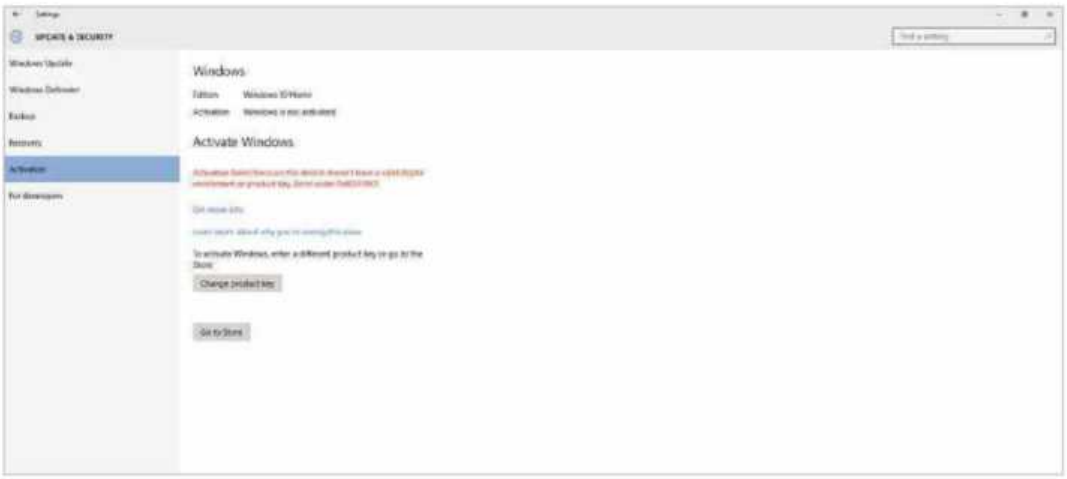
Alan

Activation difficulties with Windows 10 have been quite a problem for many, so you're not alone here. In fact, they caused so many problems, Microsoft addressed things in the November 2015 update, which streamlined the activation process. This is likely what the agent you spoke to meant. If you've not already done so, I'd check that your Windows updates are up to date, and include the November entry.

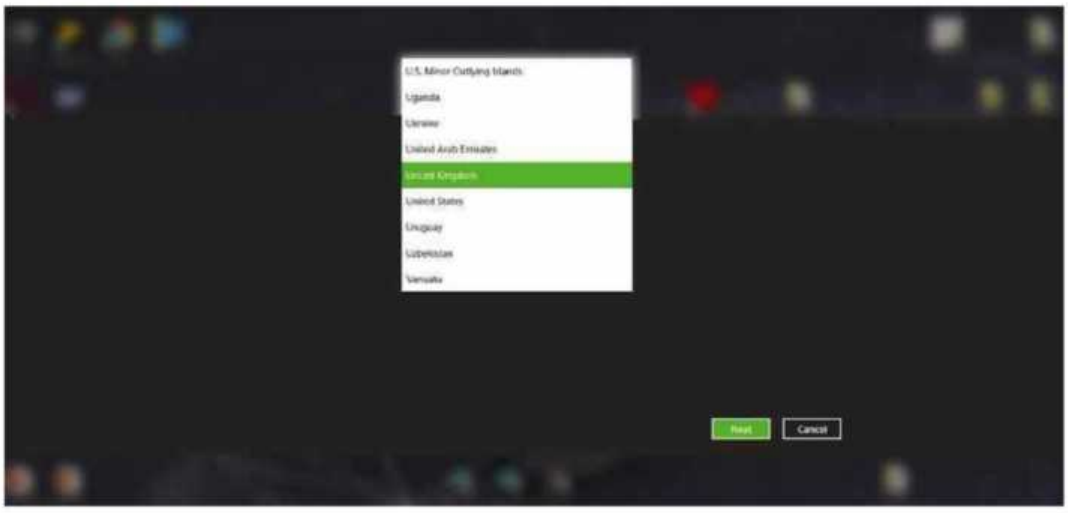
The error code you're getting, 0x803F7001, as seen in your supplied screenshot, can be addressed by running through the activation process again. To do this, go to Start > Settings > Update and Security > Activation > Change Product Key. Here you'll need to enter the product key of your original OS, in this case the Windows 7 key you used. Follow the steps and Windows 10 should reactivate.

If this doesn't work, you may need to activate over the phone using the activation toll-free number. To do this, press Windows+R, and in the run box, type 'slui 4' and press return. Select your region and click next to be given the appropriate number. Dialling this will give you confirmation ID numbers. Enter these numbers into the appropriate fields and click on Activate. This should then properly activate Windows.

Failing this, you may need to go through the motions from scratch, with a format and re-installation of Windows 7, followed by the upgrade to Windows 10.



Error 0x803F7001 is a fairly common activation problem



You can activate Windows 10 by phone using the built-in tool

Blackout

As a long established reader of Micro Mart, I normally get out of trouble by reading the tips and advice in your magazine, but I have a problem that I can't seem to resolve. I recently bought a custom built PC. The spec is:

- ASUS Z97-P motheboard.
- Intel i7 fourth-generation processor.
- Samsung EVO 850 SSD.
- Pioneer BDR.
- Corsair RM750 power supply.
- Seagate Barracuda 1TB HDD.
- PNY Nvidia GeForce 970GTX.
- ASUS Xonar DS 7.1 sound card.
- Microsoft Windows 10 Pro.

To accompany the new PC, I purchased an AOC Q2577PWQ Monitor, but I am completely puzzled, as the monitor just won't work. When plugged into the DVI socket or any other socket on the PC or monitor using the appropriate leads, all I get is a black screen.

The previous monitor (a Samsung) was uninstalled in device manager, reverting to 'Default PnP' monitor, but no matter what I try, I cannot install the AOC monitor. This is the second AOC Q2577PWQ I've had because, I thought the first was faulty. Your help in this matter would be appreciated.

Roger

As you've already tried another monitor, I think we can safely assume that the problem is not with the display itself, at least in terms of faults. Therefore, the problem you have must lie with something else in between, at your PC's end or in the actual display set up.

The first thing you should check is the input selection for the AOC monitor. Many monitors don't automatically select a video input, so it could simply be that your monitor is not set to DVI mode. You'll probably find this in the monitor's on-screen menu. Ensure you set DVI as the input method.

Likewise, also check your BIOS, and ensure your system isn't forcing another graphics card input. The ASUS Z97-P has on-board graphics, including DVI-D, so the system may actually be using the on-board display and not the Nvidia GeForce. Try connecting the monitor to the on-board GPU to check this. Try the monitor using a standard VGA or even HDMI cable, so you can, at the very least, investigate other fixes for the DVI problem, including this.

Next, turn your attention to the cable. There are various kinds of DVI cable, and not all will have the same effect depending on video card and computer setups. For example, a single-link DVI cable can only display 24-bit colour depth, not 32, which can cause problems. If you're using the same DVI cable, even when you tested the second monitor, it could simply be down to an incorrect or faulty DVI cable. Try another, if you can.

Next, it may be worth double-checking your drivers. Ensure you have the latest graphics card drivers and, more importantly, also make sure you have the latest BIOS firmware. You may need to flash the BIOS, which you can obtain from Asus's website.

If you're getting a black screen, it's always worth checking your motherboard's display output BIOS settings

Gaming i3?

I've acquired a cheap, but promising PC from a sale, and I was hoping to use it as a gaming system. I've set it up and installed a few games, but despite having a 2GB GPU and 8GB RAM, games sometimes don't run as smoothly as I'd like, and some suffer from pretty poor frame rate drops.

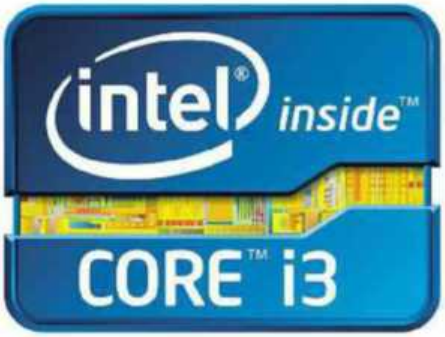
The system has an Intel Core i3 CPU, which seems to meet the minimum requirements, but performance is often less than impressive. Can you suggest anything?

Joe

Not knowing what the rest of the components are, it's hard to accurately provide a complete answer here, but given what you've said, I'd have to suggest a problem is the Core i3. Although the system may well meet the minimum specifications, the i3 is the bottom end of Intel's range of Core i CPUs. As long as your GPU and RAM, as well as the system in general are up to scratch, I'd say it would be worth looking at an upgrade for the CPU, as your current one is likely acting as a bottleneck, unable to perform as well as is required by the rest of the hardware and games.

If you're planning on a lot of gaming, it really would be worth going for a Core i7 or an i5 at the very least. This would give you much more processing power in terms of high-end apps and game, and you should see a very noticeable increase in performance, with much faster and stable frame-rates.

Core i3 CPUs are decent but are not intended for high-end use



ASK JASON

Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Cheap As Chipsets

New year, new PC! I'm planning to build a gaming rig, probably based around a Skylake Core i5 or i7. I'm hearing a fair bit about ASRock's new LGA 1151 motherboards that don't use the Z170 chipset but still allow overclocking. Is this a route worth taking? I guess it could save a few quid. I understand these boards don't support Hyper-Threading, though, so would you recommend an i5 (four real cores) over an i7 (four real cores plus Hyper-Threading)? I realise that either way I'll need a K-series chip.

Will, Gmail

*Officially, as you suggest, Intel CPUs can only be overclocked on systems using Z-series chipsets. However, on the LGA 1151 platform, ASRock has managed to facilitate overclocking on cheaper chipsets. Planned for imminent release are several overclocking-friendly H170 boards, a B150 board, and even a C232 board (for Xeons). It's true that initial reports claimed that these would disable Hyper-Threading – even when not overclocking – but it turns out this was a misinterpretation. Core i3 and i7 CPUs will *not* be crippled.*

*These days, overclocking is usually achieved by increasing a CPU's multiplier, and as you know, Will, a K-series CPU is needed. I think this method can still be used on these ASRock boards, but users will also be able to bump up the 100MHz base clock (the BCLK). This means *any* CPU can be overclocked. Altering the base clock normally results in instability, but apparently ASRock has overcome this. Sleep modes (C-states) and Turbo Boost have to be disabled – only if overclocking – but no enthusiast is likely to worry about that.*

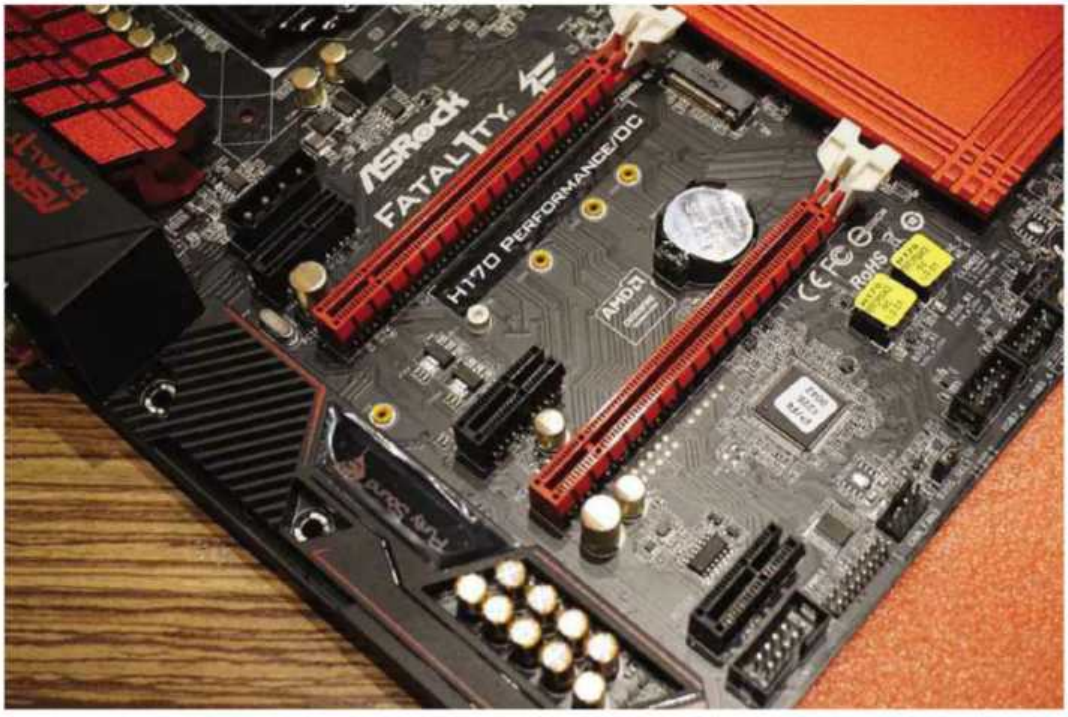
*As well as ASRock, Supermicro has entered the fray. Now, Supermicro is in the server game, where products need to be as stable as a table, so I can't fathom why it's offering overclocking motherboards of any description, never mind ones somewhat less than kosher. MSI, Gigabyte, and others haven't committed one way or the other, but Asus is sticking solely to the Z170 and upcoming Z270 for the overclocking market, stating that the potential for problems with other chipsets could harm its reputation. There may be something in that, but it's just as likely that Asus simply doesn't want to upset Intel.**

So, in summary, should you buy one of ASRock's non-Z boards or not? In you case, Will, I reckon not. A Z170 board can be had for £80, and I'd be surprised if the ASRock models dipped below £60. When you're building a gaming rig, especially one with a K-series Core i5 or i7, there's little sense in saving a mere £20. Better to do things properly.

On the other hand, for users putting together a system in the £200–£300 bracket, with a Core i3, Pentium, or Celeron, paying £60 instead of the usual £45 for a motherboard would probably be money well spent. A possible 50% increase in horsepower for £15? Yes, please! The prospect of building a rocket ship around a £35 Celery is mouth-watering indeed.

** Asus has a cast-iron relationship with Intel, and there's a legend behind that. Is it true? Your guess is as good as mine. Read all about it:* ***goo.gl/oBhKBY****.*

Overclocking could be back within the grasp of skinflints like me



Home Help

I recently bought an Asus RT-AC87U router and my plan was to use it to replace my BT Home Hub 4. I'm on BT Infinity and the Home Hub plugs into the fibre modem. I thought all the connection settings would be in the modem and that swapping in the Asus would be straightforward, but I just can't get online. I'm back to using the Home Hub. Can you help? What settings do I need? Or is it simply not possible to use a third-party router?

Francis Kinsler, Gmail

Yes, it's possible, Francis. The settings to place in your new router are as shown below. I've grabbed these from the following page on BT's website: ***goo.gl/b0x23i****.*

- *Username: [anything you like]@btbroadband.com*
- *Password: [None]*
- *Encapsulation: PPPoE*
- *Multiplexing: VC-based/VC-mux*
- *VPI: 0 [zero]*
- *VCI: 38*
- *Authentication: CHAP*
- *Modulation: G.dmt*
- *DNS: auto*

If some of those settings aren't there (or some are combined) – the list was originally intended for ADSL connections (which would need the encapsulation to be PPPoA/ATM) – don't worry. For the username, you can also use [anything you like]@btinternet.com or [anything you like]@hg[any two-digit number].btinternet.com. If the router baulks at having no password or your connection keeps timing out, use 'password' (without the quotes).

Note – The Home Hub 5 includes both the router and the fibre modem. There aren't two boxes as there are with the Home Hub 3 and 4 (earlier Home Hubs only support ADSL, not fibre). I'm not sure if using a separate router with this new Hub is as easy or even workable. Anyone tried it and won't?

Is it possible to use your own router in place of the Home Hub in a BT Infinity setup?

Recovery Position

A while ago I purchased an HP 110-405na desktop PC. This came with Windows 8.1, which I've now upgraded to Windows 10. I'd like to be able to recover this from a USB stick if I ever need to, but I can't work out how to set this up. HP's built-in tool uses the recovery partition on the hard drive and only puts back Windows 8.1. Help!

Phil, TalkTalk

This is probably far simpler than you ever imagined, Phil. Click the Start button, select Settings, then select 'Update & security'. From there, select Backup and then click the link at the bottom – 'Go to Backup and Restore (Windows 7)'. This will open good old Control Panel and present you with exactly the same backup options that are available in Windows 7 (but which are inexplicably absent in Windows 8.1).

Click 'Create a system image'. In the new window, make sure 'On a hard disk' is selected (it's the default option), then choose your USB stick from the drop-down menu (I know it's not a hard disk, but let's overlook that). The required capacity of the USB stick depends on the size of your Windows installation, of course. The stick has to be formatted to NTFS.

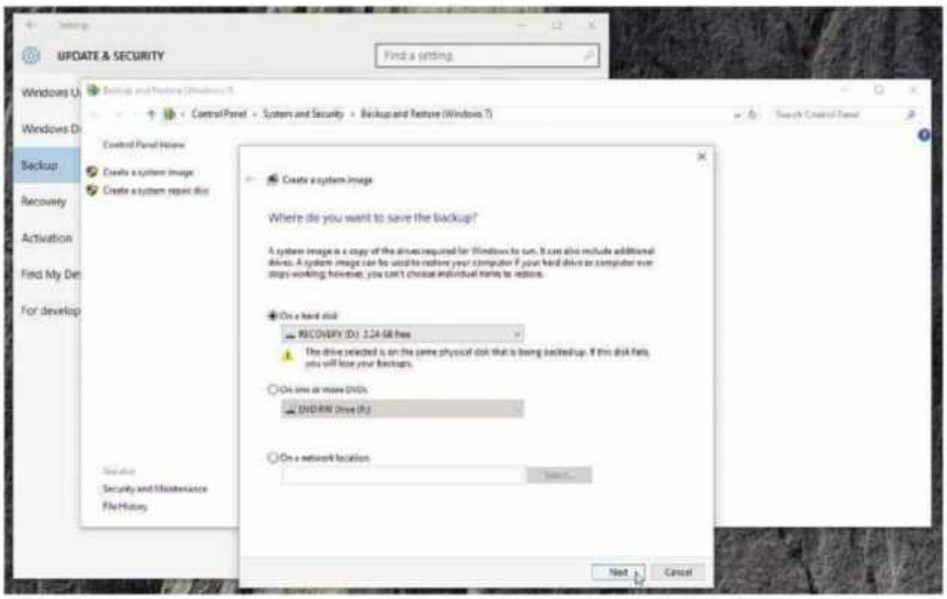
Once you're done and back at the main window, click 'Create a system repair disc'. You'll need a blank CD for this – just follow the prompts.† If you ever need to, use this CD to boot up the PC, and from there you'll be able to reinstate your system image and get yourself up and running in short order.

The best time to make a system image is after a clean installation, once your most-used programs are installed and you've got everything set up as you like it. There's little point in creating an image some way down the line, once the PC's stuffed with junk, as reinstating the image would just put it all back.

In those situations, you're best going to 'Update & security', clicking Recovery, and selecting 'Get started' under 'Reset this PC'. Choose the 'Keep my files' option, which is explained thus: 'Removes apps and settings, but keeps your personal files.' Windows 10 itself will be installed from scratch.

† If you'd prefer to have the repair disc on a bootable USB stick, visit ***goo.gl/J4XtlX*** *to see how to do it.*

Windows 10 reinstates the facility to make a system image, though you'd be forgiven for not realising



Crowdfunding Corner

This week, the current hot trend for wearables meets the previous hot trend for motion-control devices.

Gestor Air Mouse

The Gestor is a single device which can act as an air mouse, presenter and smart TV scroller, answering the completely reasonable question: 'why those devices aren't all one thing anyway?'

The device's built-in sensors mean you can control a variety of devices through motion alone, and even several devices simultaneously. As well as a motion sensor, three built-in rings can be tapped or stroked to act as various different inputs, including left and right mouse button. The device is only slightly bigger than a standard market pen and fits in most hand sizes, with a AAA battery providing power for months of use. It's compatible with any USB-capable PC, and can also connect to a number of other devices, from VR headsets to smart TVs, media centres and even things like home heating control – as long as there's a USB or Bluetooth input available to the device, you are good to go.

If you're quick you may be able to get in on one of the remaining Early Bird pricing tiers, which will allow you to pick up a Gestor in one of four colours for CAD $65 (£32). That's a not-to-be-sniffed-at 35% off the RRP of CAD $99. There are limited numbers available at higher prices – but even at worst you can expect 20% off if you dedide to back it.

Devices ship in June 2016, so there's not a huge wait assuming it all goes to plan!

URL: kck.st/1OPcLIa
Funding Ends: Monday, 15th February 2016

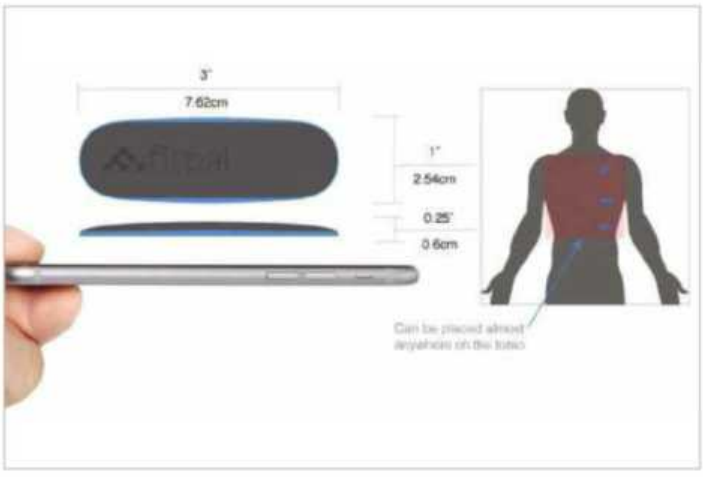
FitPal

Wearables that claim to offer heart-rate analysis are often a bit suspect in terms of their accuracy, which is why FitPal has decided to produce a dedicated monitor. Connecting to your phone, tablet, PC or laptop, the FitPal can monitor a huge number of metrics including heart rate, step count, calories burned, sleep quality and even skin temperature. The super-flat design allows it to be stuck directly to your body where it can remain to monitor and record your vital signs.

Tools for the associated software include Heart Rate analysis, Exercise Readiness tracking, a Health Risk warning tool, stress monitor, biological age analysis, irregular heart rate detection, and much more besides. The FitPal is made of hypoallergenic silicone with a 100% waterproof design, and it can handle 7 days of use without a charge (it charges wirelessly) and store 5 days of data if separated from its parent device.

We suspect that by the time you read this the cheapest availability ($159/£110) will have run out, but it's virtually guaranteed you can pick one up at the next-cheapest tier of $179 (£124), which gets you the FitPal patch, its wireless charging station, 50 adhesive stickers and lifetime access to the FitPal App platform. Only down side? The FitPal isn't planned to ship until November 2016. Might want to start your training regimen before it arrives, then.

URL: kck.st/1Kd5z38
Funding Ends: 6th Sunday, March 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

CyberGhost 5 For Android

David Hayward uses a secure stick with which to beat the prying eyes of the internet

We've covered a number of programs in the past that are designed with your online security, privacy and anonymity in mind.

Most of them are really good and do the job of keeping you private and safe very well indeed. However, there's one program that stands head and shoulders above the rest and works to better complement the already fantastic services offered.

CyberGhost 5

We won't go into too much detail this time around regarding the necessity of privacy and being anonymous when online; there's already far too much news in this area already. And we imagine we don't have a need to lecture you on the importance of security while using the many free wi-fi hotspots and other pits of unsecure despair.

Needless to say, though, if you're online, no matter how long for, then it's worth protecting your right to privacy.

CyberGhost 5 for Android is an extension of the excellent Smartphone and Tablet Protection areas of the Premium and Premium Plus plans, and it's incredibly simple to use. All you need to do is sign up for one of the aforementioned plans via the CyberGhost site. The various plans offer good value for money; check out **goo.gl/dqIRr9** for the latest pricing.

Once you've got your account up and running, download and install the CyberGhost 5 Android app from the Google Play store and enter your account details to log in with. When you're in, you'll be connected to the many servers that the CyberGhost team operate through the most secure L2TP VPN protocol with a separate IPSec encryption technology.

This means that once you're connected to the CyberGhost encryption tunnel, it's virtually impossible to be hacked while you're on a public network, such as a free wi-fi hotspot.

In addition to the protection against tracking cookies, data miners and other unpleasant things and, as with the desktop version of the CyberGhost software, you can choose to mask your IP address to any one of the many different countries around the world. That means your connection to the internet will identify you as being in the USA while you're actually in Eastern Europe, for example.

Features At A Glance

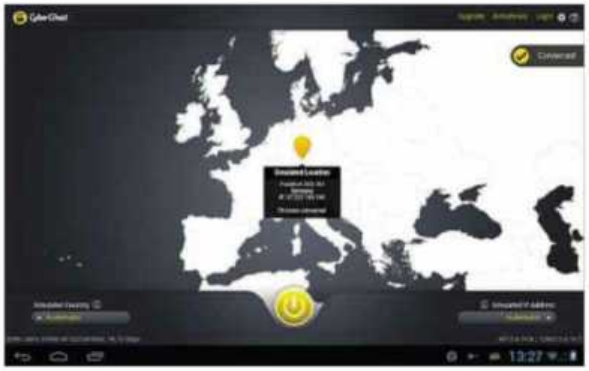
- Protects your privacy online.
- Allows unlimited anonymous and secure web browsing.
- Protects passwords and other sensitive information from hackers and criminal data hunters in public networks (e.g. for safe online banking transactions).
- Free proxy to access content you want.
- Bypasses web-blocking by government and business oriented censors.

Conclusion

If you're passionate and determined to remain secure when on the move, then we strongly suggest you look into some form of privacy and online protection. If you value your online freedom and privacy or you want to have access to the content restricted to the country of its origin, CyberGhost 5 is the one app we wholeheartedly recommend.

In a nutshell, it's easy to use, secure, safe and doesn't have any detrimental effects to the operation of your device. CyberGhost 5 is perfect for those on the go, those who use hotspots and those who just want security peace of mind.

Log into your CyberGhost account...



And become invisible to the internet

CyberGhost is possibly the best and most secure VPN there is

Logging Off

The insanity that is CES 2016 has been over for a while now, thankfully. This year, along with all the previous ones, I made the tactical decision not to fly to Las Vegas and indulge in what appears from the outside as the American equivalent of Panto. What amazes me, to a degree, are the people – compelled, I don't know how – who go there to be close to things you can't buy from those who don't sell them.

If CES is anything, though, it's a litmus test, where ideas are thrown like deceptively slippery mud at a wall, in the hope that they might defy gravity. Mainstream media flocks there because, between the stories of unrelenting terrorist brutality and corruption in organised sport, they really need something that's fairly light-hearted. Maybe a segment about a TV that contains real fish? Or a phone that predicts exactly when you'll die? It doesn't really matter. As we watch the quirkier and quirkier reports come in we pray for a correspondent who has a least learned to question if these things will be the 'next big thing'. Given that they've been their ten years running, and have yet to report on one that actually was, you would think they would have learned by now.

Browsing through the daily reports, it's hard not to get exceptionally cynical about the tech industry in general, and what purpose it has in the lives of many. My personal favourites this year were the watch that looks like a watch, the outfit that can tell your mobile phone how full your bladder is, and the thing that the Internet of Things doesn't have that it obviously needs. What blows my mind each time CES time comes around, however, is that there is a physical show at all, because in almost every respect that era seems entirely behind us here in the UK.

Some of my fondest memories of the early computer era were the incredible trade shows that were popular in the mid-eighties. Along with lots of minor regional events held in Manchester and Birmingham, there were at least three or four big ones each year in London, usually in Earl's Court. At the time I was working for a company that often had a stand, so I'd get to come and set up a day beforehand. This allowed me to see what was new and exciting without jostling through the sharp elbowed public.

I vividly recall playing with the AMSTRAD PC1512 before anyone knew it officially existed, and tinkering with the ATMOS Atom before its press release. Those were halcyon days as far as I was

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concerned, and ground was genuinely being broken in a way that it rarely is now.

One big difference was that if you showed a gizmo off at one of these events then people really expected companies to deliver it, and within the timescales promised. `When they didn't, or it was late, they got plenty of stick from media and public alike. These days we've all got so used to seeing things demoed that never see commercial release that it can be shocking when they do become available.

Yet, despite all my scorn, CES goes on year-after-year. It must cost the companies that attend a fortune, not to mention those who travel from across the globe to experience it first-hand. Next year the show will celebrate its fiftieth anniversary, so it must perform some purpose. Even if what that might be now entirely eludes me.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Cost-Efficient, **8** XML-RPC, **9** Demise, **10** Antonov, **12** Usury, **14** HTTPS, **16** Presume, **19** Ethyne, **20** Firkin, **22** Compton Effect.
Down: 1 Boom, **2** Stereo, **3** X-Factor, **4** Tilde, **5** Biomes, **6** Angstrom, **11** Notation, **13** Grifter, **15** Psy-Ops, **17** Strife, **18** Xenon, **21** Inch.

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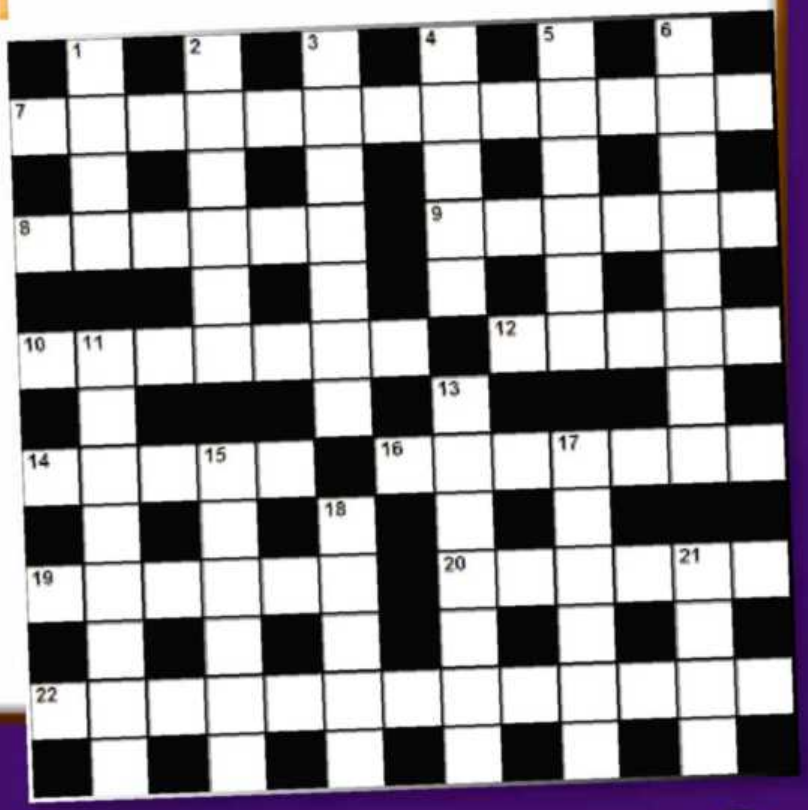
This week the world said farewell to two talented people who we here at Micro Mart – and pretty much everyone, it would seem – were very big fans of. We found the oupouring of appreciation and sadness on social media to be a lovely sentiment – sentimental yes, but lovely nonetheless. It was also cathartic to know that we were not alone in feeling a little bit down about the whole thing. For some people, though, it was less appealing. There were a couple of talking heads out there bemoaning the outpouring of sadness as a ninsincere Twitter-driven phenomenon, but that seems an especially cynical line to take. People have always fallen back on sharing stories and memories when people die, and though millions of people sharing their – often very personal – memories of a celebrity can be a little overwhelming, it doesn't make the act of doing it any less positive. The social media space has encouraged us all to share, and share we will – whether a couple of contrary pens-for-hire say we should or not. If the internet has taught us one thing, it's that though it may seem anathema to you, someone out there loves it.

THIS WEEK'S CROSSWORD

Across
7 In the field of differential equations this problem is a differential equation together with a set of additional constraints. (8,5)
8 Fasten or connect something to something else. (6)
9 A sharp stab of pain. (6)
10 Resembling an abyss in depth; so deep as to be unmeasurable. (7)
12 See below. (5)
14 A box you can create to share your Facebook profile, photos or Page on other websites. (5)
16 In Twitter a company ticker symbol preceded by the U.S. dollar sign, which when clicked will show other Tweets mentioning that same ticker symbol. (7)
19 Someone who avoids work by staying away or leaving early. (6)
20 A very light and porous volcanic rock formed when a gas-rich froth of glassy lava solidifies rapidly. (6)
22 Facebook tools that other websites can use to provide people with personalized and social experiences. (6,7)

Down
1 HTTP request method designed to request that a web server accepts the data enclosed in the request message's body for storage. (4)
2 Relatives by marriage. (2-4)
3 In Twitter any word or phrase immediately preceded by the # symbol, which when clicked will display other Tweets containing the same keyword or topic. (7)
4 A protocol to the United Nations Framework Convention on Climate Change. (5)
5 A unit of measurement of angles equal to about 57.3°, equivalent to the angle subtended at the centre of a circle by an arc equal in length to the radius. (6)
6 .bg TLD (8)
11 A device, object, or system whose inner workings are unknown; only the "stimuli inputs" and "output reactions" are known characteristics. (5,3)
13 Englishman and Whig statesman who under George I was effectively the first British prime minister. (7)
15 Yield to another's wish or opinion. (4,2)
17 An allusion or imitation by one artist to another. (6)
18 Someone who deliberately posts contentious and inflammatory remarks online in order to provoke others. (5)
21 A shape whose base is a circle and whose sides taper up to a point. (4)



In Next Week's Micro Mart*

- Windows 10 special!
- How does Cortana compare to Siri and Google Voice?
- The best new features of Windows 10
- Tips, tricks and hidden secrets
- Plus the usual mix of news, features, reviews and advice

* May be subject to change

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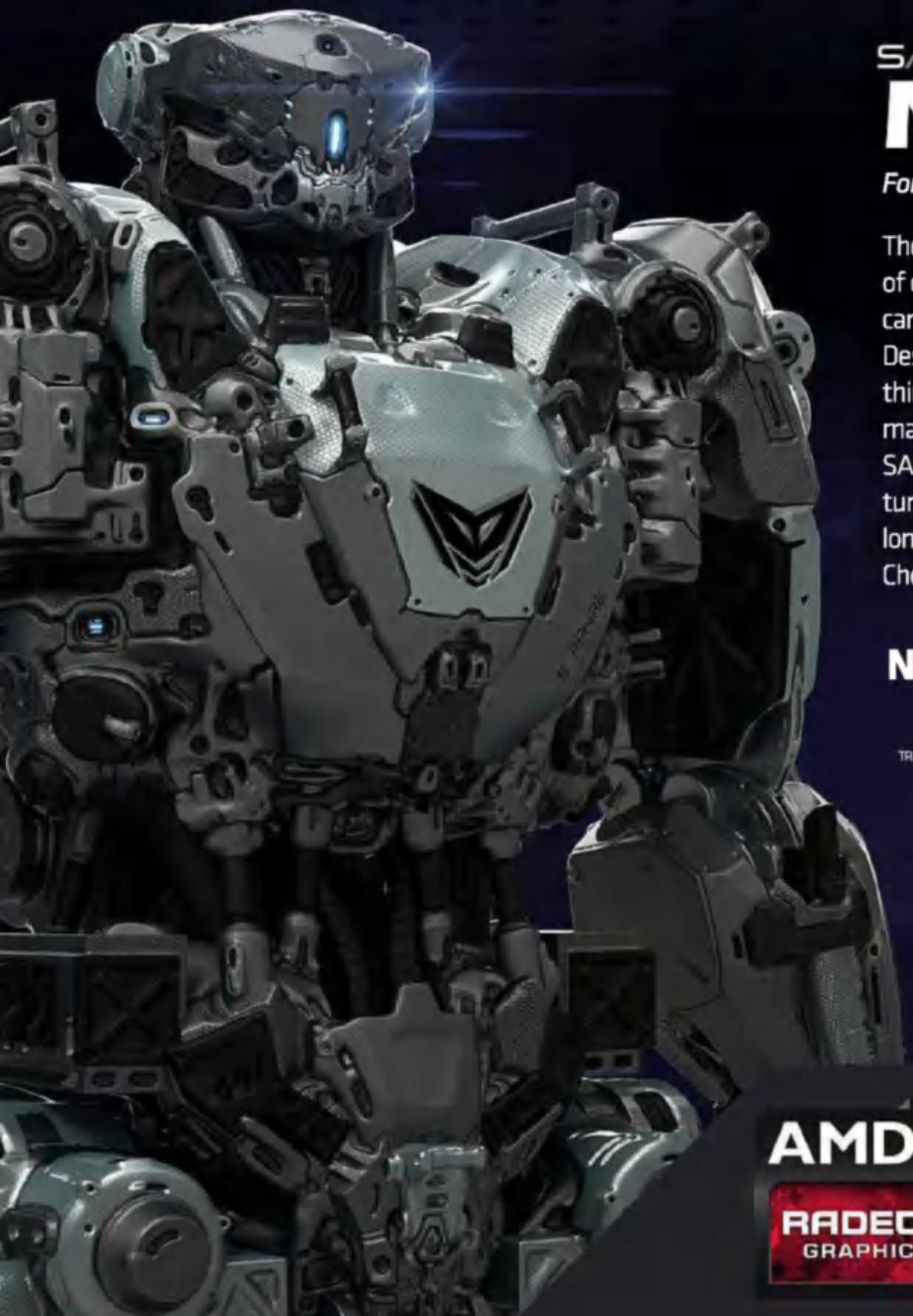

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